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XXX.

THE EPITHELIAL CONCRESCENCE IN THE LARYNX OF THE FOETAL PIG.

By Dean D. Lewis, M. D.

CHICAGO.

One of the interesting problems connected with the embryology of the larnyx is the development and disappearance of an epithelial concrescence by which the future cavum laryngis is temporarily occluded. The extent and significance of this concrescence and the factors concerned in its production and disappearance have been variously interpreted by different investigators.

In studying a series of tranverse sections through the cervical region of the fœtal pig, several points are suggested, which have a direct bearing upon this subject. The conditions found in the pig vary considerably from those described in the human embryo. While it is impossible to draw conclusions in regard to the human embryo, from the study of the pig, the conditions found in the latter are instructive.

Roth[1] first called attention to the fact that the masses forming the laryngeal anlage are in certain stages of their devel-

opment united to each other by an epithelial tissue. He describes this epithelial concrescence as not being limited to the aditus laryngis, but as extending as far caudalward as the future rima glottidis; even as far as the beginning of the trachea. In his description he mentions a small space in the posterior part of the epithelium, which he regards as the origin of the laryngeal cavity. This space is seen in figure 1. He describes small accessory openings, which by confluence become larger and result in the formation of a lumen and states that the process of opening always begins dorsally and extends toward the ventral side of the embryo.

Roth, as was later shown by Koeliker[2], was in error regarding the origin of this epithelial tissue, as he considered it to be the remains of an epithelial membrane, which in early stages separates the mouth cavity from the foregut.

Putelli[3] mentions an epithelial concrescence in the region of the ventriculus laryngis of the embryo dog.

Kallius[4], in summing up his conclusions upon the embryology of the larynx, states that it is difficult to interpret the significance of the extensive epithelial concrescence in the fœtal larynx; that in the stages examined by him there is always present a small posterior opening, which communicates with the pharynx above and the trachea below. He thinks it difficult to say whether the concrescence is dependent upon the rapid growth of the arytenoid anlage, or whether by it the lateral walls of the larynx, originally projecting into its lumen, are flattened and moulded into their definitive form. In any case, phylogeny offers no analogy. It is a cænogenetic process, and differs from any other known structural plan.

Fein[5] has recently reopened this discussion, differing from Kallius as to the extent of the concrescence, in stating that the laryngeal cavity is completely occluded, and that the posterior space formed in the young embryo does not communicate above with the pharyngeal cavity. He suggests a plausible theory to explain the formation of the concrescence, and describes the process by which it disappears. The conditions in the pig do not correspond entirely to those described by either Kallius or Fein as found in the human embryo, but suggest the factors upon which the disappearance of the concrescence is dependent, and the manner in which it proceeds.

For this study, transverse sections of fœtal pigs of different lengths were mounted serially. In all cases the vertex coccyx measurement was taken. Hæmotoxylin was used as a nuclear

stain. Congo red and eosin as a counterstain. Only those stages will be described which have a direct bearing upon the subject under discussion.

DESCRIPTION OF THE DIFFERENT STAGES.

Foetal pig, 5mm. length.

The larynx is represented as a hollow evagination from the ventral side of the foregut. The epithelium of the evagination is proliferating, as is indicated by the number of mitoses. The cells of the two sides are distinct from each other, and have not yet met in the median line. The trachea is not yet separated from the foregut.

Foetal pig, 7mm.

The epithelial evagination has increased in its dorsoventral diameter. In the ventral part of the evagination the epithelial layers of the two sides are approximated in the median line, but the epithelium of each side can still be distinguished. A median line staining heavily with eosin marks the separation. At this stage concrescence has begun, but it involves only the anterior part of the evagination. A V-shaped space is found in the laryngeal anlage, the apex of which is directed ventralward, meeting concresced epithelium. The space between the limbs of the V opens posteriorly into the foregut. As the trachea is approached the approximated epithelial surfaces separate to form a distinct lumen, which communicates with the trachea below. At this stage the trachea is formed.

Foetal pig, 9 mm.

The next important stage shows the development of the interarytenoid fold and a small posterior space in the concresced epithelium. In Fig. 1 representing a transverse section through the larynx of a 14 mm. pig, this posterior space may be seen. It is difficult to say at what level this posterior space is formed, for as yet there is no differentiation of the parts of the larynx, which can be used as guides. Cephalad, the apices of the arytenoid anlage are separated, and the V-shaped space mentioned in the 7 mm. stage is seen.

In sections passing caudalward a proliferation of the epithelium upon the medial side of the arytenoid anlage, near their apices, is found. By this proliferation the limbs of the V-shaped space, which represents the interarytenoid incisure, are united posteriorly. The space between the limbs of the V remains as a distinct opening, but the epithelium of the laryngeal anlage is still continuous with the epithelium of the foregut. Still more caudalward the proliferating mesenchyme of each side meets in the median line dorsally, and the epithelium of the laryngeal anlage becomes separated from that of the foregut. This small posterior space represents the beginning of the laryngeal lumen. It communicates above by means of the V-shaped space between the arytenoid anlage with the foregut, and below with the trachea. In this stage the conditions correspond to those described by Kallius in the human embryo. There is a distinct space in the laryngeal anlage posteriorly, which communicates with the foregut above and the trachea below. Fein, in his description, makes no mention of a corresponding condition.

No important changes occur in any succeeding stage up to the 14 mm. In this stage many are noted which demand careful consideration, as they determine the extent of the concrescence and the manner in which it disappears.

Foetal pig, 14 *mm.*

The arytenoid cartilages have attained their definitive form. Their apices are united dorsally by a thin layer of epithelial tissue. Ventrally they separate to form the postero-lateral boundaries of a ventral space, which is the aditus laryngis. The anterior boundary of this space is the epiglottis. The ventral opening extends caudalward through a few sections, and then disappears, being replaced by a concresced epithelium. The epithelium lining the ventral opening consists of a single layer of cubical cells. The arytenoid cartilages are united upon their medial surfaces by a mass of epithelial tissue. It is impossible to make any estimate of the number of layers of cells at this level. The epithelium here has proliferated greatly. In the 13 mm. stage the V-shaped space, incisura inter-arytenoidea, is still seen, while in the 14 mm. stage, by the increase in the size of the arytenoid cartilages and the proliferation of epithelium upon their medial surfaces, it has been reduced to a shallow depression. In sections passing caudalward the small posterior space is found, but it no longer communicates with the pharynx, as in the previous stages. Its upper opening is occluded by

the thickened and concresced epithelium upon the medial surfaces of the arytenoid cartilages; caudalward, it still communicates with the trachea. It does not increase in its ventral diameter, and in this stage at least takes no active part in the separation of the concresced epithelial surfaces. Figure 2 represents the reconstruction in wax of the larynx of a 14 mm. pig, enlarged 66 2-3 times. The ventral and dorsal spaces are seen, but they do not communicate with each other. The future cavum laryngis is occluded.

At this stage the conditions correspond in part to those described by Fein in the human embryo. In his reconstruction upon paper he represents two cone-shaped openings. The apex of the upper cone corresponding to the ventral opening above described, is directed caudalward and ventralward. The apex of the lower cone is directed cephalad and dorsalward. These two apices are separated by a layer of concresced epithelium. The representation of the ventral space corresponds to the condition found in the fœtal pig. The dorsal space in the pig, however, has no ventral extension, and Fein's representation of an open space corresponds to an area of concrescence in the pig.

In this stage there should be noted, especially, the increase in the size of the arytenoid cartilages, and the thickening and concrescence of the epithelium of the incisura interarytenoidea, which occlude the pharyngeal opening of the posterior space. Kallius mentions the thickening of the epithelium at this level, but Fein has seen neither proliferating epithelial cells nor increased thickness of epithelial layers.

Foetal pig, 17 mm. length.

The ventral space is changing in shape and increasing in its transverse and longitudinal diameters. It is still lined by a single layer of cubical epithelial cells. Posteriorly the sagittal concresced area is seen. Surrounding the small posterior space, the epithelial cells form many layers, while anteriorly, near the ventral space, there is but a single layer on each side. The muscles and cartilages of the larynx are being differentiated.

Coincident with the differentiation of the indifferent mesenchyme into muscle and cartilage there occur important changes, which later result in the disappearance of the epithelial concrescence. While these changes are seen in earlier stages, they are best exemplified in the 27 mm. pig.

Foetal pig, 27 mm.

The cartilages and muscles are fully differentiated and the ventriculus laryngis has begun to develop. The larynx is enlarging symmetrically. The ventral opening has increased constantly in size, and the sagittal concresced area is well advanced in its process of opening. The opening progresses from the ventral to the dorsal side of the embryo, and is apparently dependent upon an expansive growth of the anterior laryngeal wall, which exerts a traction upon the concresced epithelial surfaces. Although solution of the concrescence is well advanced at this stage, no accessory openings are found which by confluence form a laryngeal cavity, as stated by Kallius and Fein to be the case in the human embryo. The opening into the ventricle shows no concrescence, but lateralward its epithelial surfaces are in contact. This is evidently a form of concrescence, but it is not extensive. Fein has not noted any concrescence in the ventricle of the human embryo. In the last stage described by him the concrescence has almost wholly disappeared, and the ventricle has not yet been formed. This does not preclude the possibility, however, that the epithelium of the ventricle may be partially concresced when it develops. Putelli has described an epithelial concrescence in the ventriculus laryngis of the dog.

In the 35 mm. stage, the changes which result in the disappearance of the concrescence are progressing rapidly, and while in subsequent stages these same changes are seen, but in different phases of development, a new process is also to be noted. Accessory openings have appeared in the epithelial tissue uniting the medial surfaces of the arytenoid cartilages, so that the epithelial concrescence is limited to the middle part of these surfaces. Anteriorly and posteriorly they have become separated. The opening of the concresced sagittal area, in sections farther caudalward, is seen to be extending dorsalward. The accessory openings by confluence form large spaces, by which eventually a communication is established between the small posterior space and the sagittal opening formed by a separation of the concresced surfaces. In Figure 3 a transverse section of a 40 mm. pig is seen. The section passes through the upper part of the cricoid cartilage. On the left side is the lower part of the arytenoid cartilage. In the median line the manner of opening of the sagittal concresced area is shown. At this level no accessory openings are yet to be

found. The epithelial cells adjacent to the line of cleavage have a peculiar vacuolated appearance. Attempts at staining these with muci-carmin and muchæmatin were unsuccessful. While in the 50 and 60 mm. pig the solution of the concrescence above the plica vocalis is almost complete, below it the concrescence is intact. The posterior space which was formed in the 9 mm. pig has enlarged symmetrically with the growth of the larynx, but has not increased in its ventral diameter. The sagittal opening so far has progressed from the ventral to the dorsal side of the embryo, and never in the opposite direction, as described by Roth, and represented by Kallius in the human embryo.

Foetal pig, 70 mm.

In this stage that part of the laryngeal lumen above the labium vocale is formed. At the level of the upper border of the cricoid cartilage, while there is a separation of the epithelial surfaces, which extends from the ventral to the dorsal side of the embryo, there is also an extension ventralward of the dorsal space. By the union of these two openings a laryngeal lumen is established. In the upper part of the larynx the opening has proceeded from the ventral to the dorsal side of the embryo; in the lower part the ventral extension from the dorsal space plays an equally important role. This extension ventralward is apparently dependent upon the differentiation and expansion of the cricoid cartilage. Some concrescence persists even at this stage. It is most pronounced at a level, which corresponds closely to the inferior arcuate line of Reinke. Accessory openings are numerous in the epithelium at this level and the solution of the concrescence is undoubtedly dependent upon the confluence of these spaces and the subsequent union with the ventral extension of the dorsal space. Concrescence persists the longest along the inferior line of Reinke, as noted by Kallius in the human embryo, that is, at the level of the narrowest part of the laryngeal lumen, where the epithelium is least subject to a traction exerted by the rapid expansive growth of the walls of the larynx. The muscles and cartilages of the larynx are fully differentiated, but the epithelium does not as yet correspond to the adult type.

DISCUSSION AND CONCLUSIONS.

Time of formation of concrescence and extent: Kallius

finds concrescence in the laryngeal anlage at a time preceding the separation of the trachea from the foregut. He finds this in a human embryo of 28 or 29 days. The youngest human embryo which Fein had the opportunity of examining measured 5 mm. in length, and was probably between 21 and 28 days old. In this stage he describes no concrescence or marked proliferation of epithelial cells. In the 9 mm. embryo, approximately four weeks old, he describes the beginning of concrescence.

In the 5 mm. pig embryo there is no evidence of concrescence, as the two halves of the laryngeal anlage are separated from each other dorcally. In the 7 mm. pig, however, the epithelial layers lining the evagination meet ventrally, and while the epithelium of each side may be easily recognized, for they are separated from each others by a lime stained heavily with easin, concrescence may be said to have begun at this stage.

We are justified in saying, I believe, that the concrescence reaches its highest development in the 14 mm. pig. In the 9 mm. stage, by the development of the interarytenoid fold, the small dorsal space is formed which communicates with the pharynx above and the trachea below. This opening is the beginning of the future cavum laryngis. Its extent varies with the stage examined. The conditions found in the pig from the 9 to the 14 mm. stages certainly correspond to those described by Kallius as existing in the human embryo. But in the 14 mm. pig, by the rapid growth of the arytenoid cartilages, and the proliferation of the epithelium of the incisura interarytenoidea, the cephalic opening of this posterior space becomes occluded.

Fein states that there is no considerable proliferation of epithelium in the incisura arytenoidea, a view contrary to that held by Kallius. In the pig the proliferation of the epithelium of this incisura is an important factor in the occlusion of the cephalic end of the dorsal space. From a study of the pig it is impossible to suggest any views which would reconcile the opinions of Fein and Kallius. Up to the 14 mm. stage the statement by Kallius: "Sondern es bleibt eine Kommunikation zwischen Rachen und Trachea bestehen, die, soweit ich gesehen habe, überhaupt nie ganz schwindet," is true. Beyond the 14 mm. stage the conditions found resemble more those described by Fein, with the exception that the dorsal space in the pig does not extend so far ventralward, even in the late stages, as he represents. Both the condition described

by Kallius and also that described by Fein in the human embryo are found in the pig, but in different stages.

With the appearance of the ventral opening, aditus larygis, the solution of the concrescence begins. The concrescence in its greatest development extends the whole length of the larynx, even to the beginning of the trachea, with the exception of the two spaces, the small dorsal and the larger ventral one. Figure 2.

Factors producing concrescence: Fein has interpreted the factors concerned in the production of the concrescence correctly. His conclusions are practically the same as those given by Tandler, to explain the epithelial occlusion of the fœtal duodenum. They are as follows—the laryngeal lumen in its dorso-ventral, and more particularly in its frontal diameter, does not keep pace with the growth of the laryngeal walls. These walls, composed of a dense mesenchyme, become thicker without extending much from the median line. It is only at the time in which the indifferent mesenchyme becomes differentiated into cartilages and muscles that an expansive growth occurs. The interarytenoid fold increases constantly in thickness, while the laryngeal lumen is closed.

Kallius virtually suggests the same explanation when he states that perhaps the concrescence is dependent upon a rapid growth of the arytenoid anlage. His alternative statement, that perhaps the laryngeal walls are moulded into their definitive form by this concrescence, is not plausible, for the non-resistant epithelial tissue would exert no pressure. On the contrary, the pressure exerted by the thickened mesenchyme, containing, potentially, cartilage and muscle, undoubtedly causes a collapse and concrescence of this non-resistant epithelium.

Factors concerned in the disappearance of the concrescence: No one factor is responsible for the disappearance of the concrescence. The manner in which the solution of the concrescence proceeds suggests the different factors which effect it. It has already been noted that the separation of the concresced surface in the upper part of the larynx passes from the ventral to the dorsal side of the embryo. The line of separation of the epithelium may be seen in Figure 3. At this stage the accessory openings described by Roth, Kallius and Fein, to which they attribute such an important role in the establishment of a laryngeal lumen, are not found. At a lower level, the upper border of the cricoid cartilage, the dorsal space begins to extend ventralward, to meet the dorsal extension from

the ventral space. By the union of these two the laryngeal lumen is formed. The separation of the concresced epithelial surfaces may be explained mechanically. By the upward and lateral growth of the thyroid cartilage a traction is exerted upon the epithelial surfaces of the upper part of the larynx, and the separation extends from before backward. At a lower level the growth of the cricoid cartilage exerts an influence, resulting in a ventral extension of the dorsal space. It is only at the level of the cricoid cartilage that this dorsal space takes any active part in the formation of the cavum laryngis.

To the accessory openings described by Roth and Kallius may be assigned a secondary role. These openings are found only in the later stages, after the solution of the concrescence has well advanced. In sections, made at different levels, epithelial bridges are seen, which separate the frontal and dorsal spaces. By the liquefaction of the epithelium small spaces are found which, by confluence, become larger, and finally result in the union of these two spaces. At that level, where the concrescence persists the longest, these accessory openings are found in greater number, and are important in effecting a separation of the epithelial surfaces. Here, where the laryngeal wall undergoes the least expansive growth, the laryngeal lumen is established by the confluence of these accessory spaces and their union with the ventral extension of the dorsal space.

CONCLUSIONS.

1. Concrescence of the epithelium of the laryngeal anlage begins in the 7 mm. pig. In the 9 mm. stage a posterior space is formed in the concresced epithelium, which communicates with the pharynx above and the trachea below, corresponding to the condition described by Kallius in the human embryo. In the 14 mm. pig, by the rapid growth of the arytenoid anlage, and the proliferation of the epithelium of the incisura interarytenoidea, the cephalic opening of the posterior space is occluded, corresponding to Fein's description.

2. The concrescence is dependent upon the rapid growth of the mesenchyme of the laryngeal anlage, which compresses the less resistant epithelium.

3. The beginning of the solution of the concrescence is coincident with the differentiation of the mesenchyme of the laryngeal anlage into cartilage and muscle. In the upper part of the larynx the line of separation of the epithelial surfaces extends

from the ventral to the dorsal side of the embryo. The separation of the surfaces is apparently dependent upon an expansive growth of the upper part of the anterior laryngeal wall. At the level of the upper border of the cricoid cartilage the dorsal space begins to extend ventralward, to meet the space extending dorsalward. By the union of the two the laryngeal lumen is formed. The ventral extension from the dorsal space depends upon the growth of the cricoid cartilage. Accessory openings assist in the later stages in the formation of the lumen, especially in that region where concrescence persists the longest and the epithelium experiences the least traction. The cells immediately adjacent to the lumen have a peculiar vacuolated appearance, but they do not stain with muci-carmin or muchæmatin.

4. The plicae vocalis and ventricularis are well developed before the concrescence disappears. The lateral prolongation of the ventriculus laryngis is concresced in the early stages of its development.

5. The pig embryo is probably intermediate between the human embryo, in which the concrescence has disappeared before the ventricle has been formed, and those animals, such as the sheep and calf, having no ventricle, and in which concroescence persists the longest.

6. The persistence of this concrescence may result in malformations of the larynx, such as congenital diaphragm, in which case there should be, theoretically, some accompanying malformation of cartilage or muscle.

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XXXI.

AN OPERATION FOR THE CORRECTION OF EXTERNAL DEFORMITIES OF THE BRIDGE OF THE NOSE.*

By T. Passmore Berens, M. D.,

NEW YORK CITY.

The bridge of the nose is composed of a bony arch, supported, or partly so, by a column. The crura of the arch are formed by the nasal bones and the nasal processes of the superior maxillæ; the latter are important factors in the formation of the arch, and in many skulls form at least half of the crura. The nasal bones articulate with each other, with the perpendicular plate of the ethmoid on which they rest by means of the vertical spine, with the frontal bone and with the superior maxillary bones. The "grain" of the bone of the nasal processes of the superior maxillæ runs upward and outward, or nearly straight upward. This fact is of considerable surgical importance, as it explains in part why fractures of the bridge of the nose rarely extend to the line of the face. It is useful surgically because it permits the bone to split in a straight line, or nearly so, when subjected to the proper measures, the resulting fragments being of use in the rebuilding of the crura of the arch, or permitting a splitting off of the crura from the maxillæ and allowing their replacement in a desired position.

The supporting column of the arch of the nose, the nasal septum, consists of the perpendicular plate of the ethmoid above, the vomer below and the triangular cartilage anteriorly. The perpendicular plate of the ethmoid at its articulation with the nasal bones is frequently, almost always, involved in deformities of the nasal bridge; and it is important to remember the anatomic relation it bears to the cribiform plate of the ethmoid. A study of the perpendicular plate of the ethmoid bone in the dried skull shows it possessed of no grain, being

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a plate of compact bone, liable to split in almost any direction, were sufficient force applied without due caution. The anterior border of this plate, as well as its posterior superior border, where it goes to form the *Crista Galli*, is much thicker than in its central portions, where it is quite thin. The distance from its anterior end, just beneath the anterior ends of the nasal bones backward and upward to the perforated plate, varies in different skulls, but in twenty-five adult skulls examined it ranged from one to one and one-quarter inches.

FIGURE A.

FIGURE B.

This distance may be divided nearly equally by a perpendicular line drawn through the naso-frontal angle. The importance of these measurements is considerable, and should be borne in mind when operating in this locality, for force applied laterally at a depth in the nose beyond the naso-frontal angle, while perhaps not causing fracture into the perforated plate, might readily enough cause a dangerous inflammatory action in the branches of olfactory nerves and their accompanying vessels. With this point borne in mind for the purpose of this paper the nasal septum may be spoken of as a cartilaginous and bony

wall, of use in its anterior portions in certain conditions to support and give strength to its superimposed structures.

External deformities of the nose of traumatic or congenital origin may be divided into three classes: those dependent on distortions of the cartilaginous portion, those of the bony portion, and the many combinations of these two conditions. This paper does not deal with the first class. The last two classes may be further divided into concave deformities, saddle noses, deflections of the whole nose, angular deformities and convex deformities or humps. These broad classes frequently are modified by the presence of more than one deformity. For instance, one nasal bone may have been fractured and depressed, while its fellow may have been bent outward, or both nasal bones may have been dislocated from their articulation, depressed and pushed to one side; in either case the result is a deflected bridge, flattened and broadened; if, in addition, the cartilaginous part of the nose has remained in the median line or been pushed to the opposite side, there results also an angular deformity, the combination being very unsightly. Varying from this complex condition to the simple dislocation of the whole nose from its root obliquely outward to its tip are many variations and combinations of displacements.

The first class, that of depressed bridge, usually takes one of two forms, viz.: depression from a separation of the nasal bones where each bone has been turned outward, or depression from a crushing or overlapping of these bones. In both cases the perpendicular plate of the ethmoid has been either bent, or fractured, or both, in at least part of its extent, and in many cases the nasal processes of the superior maxillæ have also been involved. Necessarily there are many combinations of these two classes, and the result is a great variety of deformities. The most common variety, however, in the writer's experience, is caused by an unequal crushing and spreading of the nasal bones with involvement at least on one side of the nasal process of the superior maxilla.

The second class, that of deflection of the bridge, may also be divided into two classes: that from a displacement laterally of the whole bony framework, or that from an unequal displacement without crushing of the crura of the arch, resulting in a displacement of one crus outward and its fellow inward, giving a particularly well-marked angular deformity with a hump on one side of the bridge. In all of these cases there is more or less participation of the cartilaginous portions of the

nose, especially of the septum, in the deformity. Deformity of the bridge of the cartilaginous portion of the nose generally is given its character by the direction taken by the upper anterior edge of the triangular cartilage, for when this edge is depressed or deflected the soft parts follow closely the depression or deflection.

Procedures for the correction of fractures of the nose have been in use from the earliest times. Hippocrates (Wright: "The Nose and Throat in Medical History") gave instructions

FIGURE C.

FIGURE D.

of great value for the correction or setting of recent fractures of the nose. In recent times much has been written on the same subject and on the subject of deformities resulting from neglected traumatism to the nose, but so far as the writer is aware, Roe (*New York Medical Record*, July 18, 1891) was the first to publish operations for the correction of external nasal deformities by subcutaneous methods without the insertion of mechanical devices. In an article by Weir, (*New York Medical Journal*, October 22, 1892), mention is made of the use of a chisel in the inside of the nose to loosen the nasal bones

from their attachments, but preference is given by him to a method requiring preliminary incision through the integument; while Roe, in the article referred to, gives preference to the internal route, and in a later article, "The Correction of Nasal Deformities by Subcutaneous Operations" (The American Medical Quarterly, June, 1899), described subcutaneous operations for many deformities, both of the hard and soft parts of the nose. The results obtained by Roe are almost ideal, and

FIGURE E.

FIGURE F.

give his operations pre-eminence over the older operations by the external route.

Paraffin injected beneath the skin is a valuable procedure in a great number of deformities, especially in those cases where there is loss of tissue from disease, as, for instance, in the saddle-nose of syphilis. It is useful also in aiding the surgeon to fill up or round out the contour of the nose in certain deformities of traumatic origin. It certainly is a valuable method for filling up deficiencies remaining after the correction of the bony deformities, and in many instances seems to the writer preferable to the somewhat difficult task of transplanting tissue

by Roe's subcutaneous methods. It is inapplicable, however, in many of those cases of nasal deformity depending in large measure for their unsightliness on various displacements of all or part of the component parts of the nose; for instance, lateral displacements, curvatures of the nose or angular lateral deformities.

In the *Laryngoscope* (March, 1899) the writer under the title "The Rebuilding of a Nose Without the Use of an Artificial Bridge," described a successful operation performed without incision for the elevation of an old depressed fracture of the nasal bones. The brilliant results obtained by Roe, together with the encouragement derived from the success in the case of the writer, and the subsequent success obtained in a series of similar cases, may be accepted as a sufficient excuse for the description in detail of the technique of an operation not perhaps new, but embodying some points at least not made clear in the literature of the subject. It is believed that the operation differs in some details from that described by Roe, although being on the same general plan.

The operation is performed as follows: The vibrissæ are cut from the vestibule and the skin cleansed. The interior of the nose is sprayed with adrenalin chlorid solution 1-1,000, followed by a spray or douche of a mildly antiseptic solution, such as boric acid. The patient is then anesthetized with ether, a mouth gag inserted, and the posterior nares tamponed. The ether is then administered on loose gauze held over the patient's open mouth. Any adhesions or synechiæ between the septum and lateral structures of the nose are divided with a scalpel. One blade of a slightly modified Adams forceps (see cut)—having the blades smoothly polished and the edges of the blades rounded—is placed well up inside the nostril to the articulation of the nasal bone with the septum, the other blade placed outside the nose, protecting the skin with several layers of gauze or with a pad of rubber; the blades are brought in gentle approximation and the forceps are then rotated outward. This procedure breaks the nasal bone from its attachments and lays it outward on the cheek. The forceps should reach almost to the naso-frontal articulation, and it is necessary to hold the inner blade firmly in the anterior superior angle of the cavity of the nose, as at times much force is required to make this fracture complete, and the instrument is apt to slip. The opposite bone is treated in the same manner. After completely fracturing the nasal bones from their attachments, perpendicular

plate of the ethmoid taking part in the deformity is corrected by fracture with the same forceps, by rotation or with the Roe (*loc. cit.*) fenestrated forceps. If the Adams forceps are used care should be taken to insert them only to a depth corresponding to the line of the external nasofrontal angle. This will largely tend to prevent fracturing the posterior parts of the perpendicular plate of the ethmoid bone. If the caortilaginous septum is involved, it should be corrected at this time. After the septum is straightened, each nasal bone, with the soft parts protected as before, is grasped with the forceps and turned toward the opposite side of the face. This procedure is important, especially in young patients, as it prevents incomplete fractures and renders the parts malleable. The forceps are again introduced straddling the septum, and the whole bridge is elevated into position by raising the blades; with the blades of the forceps holding up the bridge, the exterior of the nose is moulded by the fingers into the desired shape. If lumps are present, they should be depressed by further fracture with the forceps, or by the following procedure: a small bar of steel—the handle of a mastoid chisel suffices—previously guarded by drawing over it a piece of heavy rubber tubing, is placed against the hump and struck a blow with a mallet. At times this requires considerable force, and care should be exercised not to strike in a direction that might drive a fragment into the surrounding soft parts, or through the nasal mucous membrane. Where the nasal process of the superior maxilla takes part in the deformity, or where this process may be utilized to lengthen one of the crura of the arch of the bridge, it is split off as follows: a square-faced mastoid chisel, or preferably a chisel with a concave cutting edge (see cut), is placed within the nostril just beyond the vestibule against the protruding process. The chisel should be directed upward by holding the handle against the lips, while the cutting edge is held at the junction of the nasal process with the body of the maxilla. A few blows with a mallet will split off the process, or a fragment of it, and the splitting may be repeated through the one incision until the desired amount of bone is completely loosened. These fragments are then moulded with the rest. This splitting off of the nasal processes is particularly valuable in deflections of the whole nose, as it permits of a replacement from the very root of the nose. If the fracturing process has been complete it is surprisingly easy to reform the bony parts of the nose into a desirable shape.

There is practically no muscle strain to undo the moulding, so that until cicatricial contraction begins there is no need for the use of external appliances to act as splints. If the septum has been extensively involved it is well to insert an intranasal splint, one that will support the weight of the soft parts of the nose. For this purpose the writer uses a splint of gutta percha, shaped after the model of his "Cork Splints for Deflections of the Nasal Septum" (*Manhattan Eye and Ear Hospital Report*, 1894). They are fashioned to meet the varying conditions of individual cases, the general shape being depicted in the cut. The long, narrow anterior end is meant to be placed in the sulcus of the vestibule of the nose, which effectually prevents its slipping out of the nostril, at the same time supporting the tip of the nose.

If the septum has not been extensively involved, and if the fracturing has been sufficiently complete, the parts when moulded into position will remain without support either internal or external, at least until cicatricial contraction begins, and this is not until the considerable swelling that always follows any fracture has subsided. The after-treatment for the first three to four days consists in the external application of iced cloths, together with a frequent spraying of the nares with adrenalin chloride solution of sufficient strength only to keep free the nasal drainage and respiration. As the swelling subsides, the nose is manipulated only sufficiently to keep the parts in proper position. If there is a tendency for any part to become depressed it should be replaced and a small packing of gauze or "spunk" *fungus chirurgor* inserted beneath it inside the nostril. Cocain locally applied renders this procedure painless. The manipulation of the bones themselves, when once broken, is lacking in pain until union has taken place. This packing need not be of sufficient bulk to interfere with respiration and should be placed well up beneath the depressed fragment. If the fragment shows a tendency to spread apart externally—and in the writer's experience this is the more frequent occurrence, especially where the nasal processes of the superior maxillæ have been involved—an external splint is applied. This splint is the ordinary so-called "Fox Eye-Glass Clip," with the shell sheathing made somewhat longer and broader than usual. By bending the spring it can be made to hold firmly, and by bending the flanges pressure can be applied at any particular point, and if necessary an extra strip of metal can be fastened to the flanges, as in the photograph. These

clips may be worn constantly by the patient, even in bed, with but little discomfort. For street wear glasses may be attached. The patient should be kept under observation for from four to six weeks, and the splints, external or internal, when needed at all should be carried fully this length of time, at least for safety as a protection against cicatricial contraction. If internal splinting is necessary, one splint usually suffices. The splint mentioned may be cleansed *in situ* so readily that it need not be frequently removed.

There are various lesser deformities of the nasal bridge that can be corrected without restoring to the extensive operation detailed. For instance, a small hump caused by the outward displacement of the inferior end of a nasal bone can be reduced by a stroke or two of a mallet, protecting the skin with the rubber-armed chisel handle. When once fractured, the fragment will remain in place without further care. This deformity uncomplicated is rare, and is mentioned only as an instance of what may be accomplished by force when properly applied.

Although the operation is intended for corrections of externel deformities of the bridge of the nose, these deformities are frequently complicated by deformities of the cartilaginous portions of the nose—perhaps the most frequent complication being a deflected cartilaginous septum. In fact, the cartilaginous septum practically always takes part in the deflections of the perpendicular plate of the ethmoid. When this complication exists it must be corrected, the writer preferring the fracture method of Adams (*British Medical Journal,* October 2, 1875) or Roe, as these methods do not remove tissues that may be useful in lengthening out the supporting column. This does not alter the after-treatment other than to compel the insertion of an intra-nasal splint, and possibly to necessitate the removal after healing is complete of a septal spur or shelf. If after the nose is healed there remains a depression at any point, and this not infrequently happens, especially just below or at the junction of the cartilaginous with the bony parts, the insertion of a few drops of paraffin with a syringe may be resorted to. Where this proceedure is necessary, preference is given to the method reported by Harmon Smith (*Journal American Medical Association,* September 19, 1903), whereby the paraffin is injected in a semi-solid mass to prevent possible carriage by a blood vessel of a small mass of the paraffin in the form of an embolus or thrombus.

The correction of small convex deformities of the bridge,

resulting from the "tilting" of a nasal bone, have been mentioned. Where there is a slight degree of tilting forward and the septum is not involved, the crushing process suffices. Where the crushing process is inadvisable owing to the extent of the convexity the sub-cutaneous dissection after the method of Roe (*loc. cit.*) is resorted to. This is accomplished as follows: The patient is prepared for operation, etherized and tamponed as described. A small quantity of 1-2,000 sterile adrenlin solution is then injected hypodermically into the soft parts about the site to be operated on. This will materially lessen the bleeding. A small scalpel is then used to incise through the soft parts inside the naris just above the vestibule. This is facilitated by using a bivalve speculum to put the ala on the stretch. The scalpel should hug the bone from the junction of the nasal process of the superior maxilla with the body of that bone and extend upward to beyond the articulation of the septum and nasal bones. This proceedure is followed on the opposite side. The two incisions meeting are extended by the use of a small periosteal elevator high up beyond the deformity. Care should be exercised not to perforate the skin, but the incisions should be made as free as possible. The small finger can be inserted a considerable distance between the bone and integument, and be used as a guide for chisel, knife or saw to remove sufficient tissue to give the desired shape. If the nares are small, a bivalve speculum or a small periosteal elevator or other flat, small instrument may be used as a retractor and to protect the integument from injury. Considerable judgment must be exercised as to the amount of tissue to be removed, and care must be taken not to perforate through the parts into the nasal fossæ. The clever manipulation of transplanting a hump from its attachment into another location to fill in a depression has been untried by the writer; preference having been given to the use of paraffin after healing had taken place from the operation for the removal of the hump.

The intra-nasal splint mentioned previously for supporting the septum is made to fit each case in the following manner: A piece of sheet gutta percha is cut into a rectangle one and one-half inches long and twice as broad as the measured distance between the floor of the vestibule and the deepest part of the sulcus of the vestibule. This is dipped into hot water and bent on itself; a small steel instrument is used to preserve a lumen, while the edges are pressed together with the fingers. The splint is then trimmed with scissors or knife into the desired

shape and the edges smoothed and "annealed" by bringing them into contact with a hot metal, such as the lid of a steam sterilizer. The edge of the anterior end is flattened somewhat by pressure to avoid irritating the mucous membrane of the sulcus. This splint puts the soft parts of the anterior parts of the nose on the stretch and supports them; at the same time, being quite broad and nearly flat, it lies closely against the septum. Being locked between the floor of the nose, the inferior turbinate and the sulcus of the vestibule, it cannot slip out. It is easily cleaned, is not irritating, and is easily and quickly made.

Photographs A and B are of a patient 20 years of age, whose nose had been injured when he was about 8 years old. There was a sigmoid lateral deflection of the nasal bridge, caused by a dislocation of the right nasal bone and nasal process of the superior maxilla outward. The left nasal bone was at its anterior inferior border dislocated to the left, making a hump, while the tip of the nose was deflected to the right. The whole anterior portion of the septum was deflected in a long bend to the left and was adherent in its upper half to the lateral wall of the nose just above the vestibule. After dividing the adhesions, the chisel was used to free the right nasal process, while the remainder of the operation was completed with the forceps. The intra-nasal splint was carried three weeks and the eye-glass splint was worn six weeks.

Photographs C and D illustrate a patient 22 years old, who had his nose injured in infancy. There evidently had been a simple depressed fracture of the nasal bones involving the nasal processes of both maxillæ. The septum was bent to the right in a long bend terminating near the floor of the nose in a small shelf. There evidently had been some absorption of tissue at the point of articulation of the cartilaginous with the bony bridge. The chisel and forceps were used in this case after the small shelf had been removed from the septum by sawing. An intra-nasal splint alone was used in the after-treatment. It was carried for five weeks. The result of the operation was perfect, excepting that a small depression in the bridge remained just below the nasal bones. This was filled in with paraffin four weeks after healing had taken place *i. e.*, ten weeks after the operation.

Photographs E and F are of a patient 16 years old, with a vague history of possible injury in infancy. The bridge and tip of the nose were deflected to the left of the median line of the face. The right nasal process of the superior maxilla

was dislocated to the right. The right nasal bone was lying at an obtuse angle with this process, while the left nasal bone was raised at its whole anterior border, and with the left nasal process made nearly a right angle with the general outline of the face. The appearance of the nose was as though force had been applied to the crest of the bridge, and this crest pushed to the left. The septum nearly occluded the left nostril by a long curved deflection, in which the perpendicular plate of the ethmoid took part. The chisel and forceps were used in this case, and it was extremely interesting to see the play of the septum beneath the skin during its fracture after the nasal bones had been fractured. As the forceps with the septum between the blades were rotated to one side or the other, the whole character of the deformity of the ridge of the crest would change. Extreme rotation to one side would be accompanied by a depression of the bridge and a deflection of the tip to the opposite side. This is mentioned to emphasize the importance of the septum as part of the support of the bridge. The intra-nasal and the extra-nasal splints were worn in this case for six weeks. The deflection of the septum recurred on the opposite side to a slight degree. The external deformity was successfully corrected excepting at a point just above the tip, where there was an old cicatrix. About one drop of paraffin injected at this point was sufficient to completely obliterate all traces of his old deformity.

XXXII.

MODERN SURGERY OF THE LARYNX, PHARYNX ESOPHAGUS AND TRACHEA.*

PROF. TH. GLUCK, BERLIN.

The history of resection and extirpation of vital organs gives us weighty evidence of the fact that operative surgery, the surgery of blood and iron, is the route "per aspera ad astra." In this problem of surgical evolution are linked the names of many investigators; noteworthy advances are coupled with many retrograde steps. The history of science is, on the whole as well as in part, the chronology of human inspiration. Many errors and doubts had to be corrected and dispelled and their places taken by new truths. And this is a process that can only occur gradually. We, as mortals, see only what the end result actually is; God alone knows what results were hoped for. The ideal operative treatment is unfortunately seldom attained.

The following discussion deals with the extirpation of two vitally important organs, viz.: the pharynx and larynx when they are the seat of malignant growths. In addition, the various operative attempts on the air passages, and the deglutition apparatus in general, will be taken up.

An analysis of the history of these operations discloses a chronology which has already been tabulated by Sendziak as follows:

1. Up to 1870—a period of therapeutic nihilism.

2. 1870 to 1873 begins with Billroth's first laryngectomy, the first dawn of rational therapy, a sort of enthusiastic inspiration.

3. 1881 to 1887-88—a period of diversity of opinion. This is an era of searching critique, and extends up to the time of Kaiser Friedrich's illness.

4. From this last mentioned highly dramatic incident up to the present, the time has been occupied with a diligent investigation of the clinical and technical facts connected with malignant disease of the organs under discussion.

The Kaiser Friedrich incident aroused both laiety and profession, and the successful result of the work done demonstrates that the Kaiser's martyrdom was really a blessing in disguise.

*Monatschrift für Ohrenheilkunde, etc., 1904, Nos. 3 and 4.

We will first discuss the surgical treatment of stenosis of the air passages. König, senior and junior, Küster, Enderlen, Schimmelbusch, v. Mangold, Gallati and v. Hacker have made particularly valuable contributions to this chapter of surgery.

Many cases of stenosis of the trachea are due to extra-tracheal pressure, yet, as is the case with the larynx, a large number of cases are due to intratracheal cicatrices, due to various causes, and resulting in varying degrees of narrowing of the tracheal lumen.

When we have done all we can with bronchoscopy, intubation, and the various intratrachael procedures, then we must resort to tracheatomy performed below the seat of stricture, when possible. Since my article of 1881 on prophylactic resection of the trachea I have, with others, contended that it is possible to resect large sections of the trachea, and suture the remaining free ends together, or at least to approximate them. The following case illustrates the fact that a cicatricial canal can, under certain conditions, serve as a trachea.

I performed a laryngectomy, and sewed the tracheal stump into the wound. This stump became necrotic, the necrosis extending so far down into the mediastinum that after the tracheal rings has been cast off I could only reach the lumen by inserting one of my "lobster-tailed" canulæ 10 c. m. from the skin opening. Around this canula dense fibrous tissue formed, making a canal 10 c. m. long, which served as a trachea. The configuration of the external scar was exactly the same as it is in the cases of laryngectomy that run a typical course.

Bruns, Küster and others have resected the trachea for various pathologic causes, and have attained permanent results. The lower tracheal segment is sufficiently mobile to make operations in this region relatively easy and safe proceedures. In quite a large number of cases of tracheal stenosis in children, due to intubation, I have performed secondary tracheotomy, and then treated the stenosing diaphragm as follows:

First I performed a tracheotomy as low in the jugulum as possible, between the thyroid isthmus and the arteria anonyma. Then I excised the tracheal fistula, doing at the same time a transverse resection of the trachea, in the region of the scar tissue formation, laying bare the anterior wall of the esophagus. As many tracheal rings are resected (even the cricoid cartilage, if necessary) as is necessary to secure two wide and easily adaptable lumina. After the resection, a circular suture is

applied, posteriorly from within outward, and anteriorly from without inward. All reflex phenomena and tracheal symptoms disappear rapidly. The patient, who before the operation was aphonic, now speaks loudly and clearly, in case one has not had to resect too much of the cricoid. The external wound is often completely sutured over the tracheal anastomosis; sometimes a small iodoform drain is inserted. In from three months to a year after the operation, varying with the age of the patient, the tracheotomy tube may be removed permanently. In the meantime the patients wear a tube fitted with a cork or valve, so as to allow phonation. If so much trachea has been resected that it is impossible to unite the two ends it may be possible to bridge over the defect with skin-flaps.

This is done as follows: A rectangular skin-flap is taken from the right side of the neck and used to cover the posterior part of the defect, its two edges being sutured to the tracheal stumps. After it has healed in situ, another rectangular flap is taken from the left side of the neck, and turned over so that the epidermis side covers in the anterior surface of the defect. Thus the space between the two tracheal stumps is converted into a tube. On this last flap is engrafted a skin-periosteum flap, so as to give a firm consistence to the newly made tube.

Of course a cannla must be worn in the lower part of the trachea during the time that all these plastic proceedures are being carried out. The skin which was transplanted gradually takes on a lubricated, mucous character, without any anatomically demonstrable metaplasia of its cells. It adapts itself completely to the new function that it has to take on.

If the new formed trachea is not firm enough to withstand external force, despite the skin-periosteum flap, then we must make a permanent tracheal fistula, to serve as a sort of safety valve against attacks of dyspnea. This lip-shaped fistula can be conveniently closed by the finger or by a pad worn around the neck, when it is desired to phonate. In speaking of laryngectomy, I shall mention a case that was cured by this method.

Tracheal fistulæ may occur as a result of loss of substance due to exfoliative cartilage necrosis. Patients learn instinctively to close these fistulæ temporarily by bending their head whenever they wish to phonate.

There are cases where in the absence of a tracheal fistula we get symptoms of tracheal stenosis due to tracheal scars, or to absorption of the tracheal cartilage, as is seen with struma.

In these cases the symptoms are referable to the fact that the membranous wall of the trachea is sucked into the lumen during inspiration. Such a state of affairs, aside from the possibility of causing immediate death by asphyxia, may cause myocarditis and cardiac dilatation. I remedy this condition by following the method of Schimmelbusch, Koenig and others, viz.: making a pedunculated periosteum-bone soft-parts flap from the sternum, excising the membranous part of the tracheal wall and covering in the defect with this flap. The flap is so turned that the epidermis side is in the lumen of the trachea. After 8 to 10 days the bridge of the flap is cut and the root of the flap turned back into place on the sternum.

When the thyroid cartilage is destroyed and a resulting laryngeal stenosis occurs, the remedy consists in splitting the thyroid cartilage and transplanting a piece of bone in the defect, preferably a bone-flap from the hyoid. v. Mangold advises the transplanting of a piece of rib cartilage under the skin of the chin, and then, after it has healed in from 5 to 7 months, to make a skin-flap containing this piece of cartilage, and transplant it into the defect in the thyroid cartilage. The piece of cartilage should be conical, so that it will tend to separate the two halves of the thyroid.

In broncho-plastics, the inverted cartilage edges are freshened, and then a bone-flap from the manubrium sterni is turned into the defect.

We are therefore in a position to-day to prognosticate perfect cures in obliterating stenosis of the trachea, situated anywhere from the cricothyroid ligament to the jugulum. These cures we institute by incision, excision, vertical or transverse suture, simple or pedunculated flap operations, using bone or periosteum or cartilage when necessary. The Belgian Laryngological Society reports (June 6, 1903) that these methods have been most successfully carried out by Professor Moure and others.

Von Hacker's attempt to use parts of the trachea itself to fill in tracheal defects is too apt to be followed by necrosis. This same objection applies to Foederl's attempt to suture the trachea to the hyoid bone after laryngectomy.

In 1897 my assistant, Dr. Oppenheimer, of Stuttgart, wrote an extensive work on "Inflammatory processes and deep suppuration of the neck." He quotes cases where retropharyngeal pus burrowed down into the anterior and posterior mediastinum. The anterior mediastinum is much more easily ap-

proached surgically than is the posterior, because the pus, especially in children, tends to gravitate out through the intercostal spaces, or, as happened in one of our cases, out through the sternum. Moreover, operations on the anterior mediastinum are being performed with good results and in increasing frequency.

The treatment of posterior mediastinitis is not mentioned in text-books on surgery. The fact that such very vital organs lie in the posterior mediastinum, and lie there so deeply buried, is enough to frighten even the keenest operator. I made some experiments in this connection (1892), even before Quenu, Hartmann and Bryant made theirs; I also attempted to incise the bronchi through the posterior mediastinum. Anselm Schwarz in 1893 wrote a work on the anatomy of the extrapulmonary bronchi. He understands "extrapulmonary bronchi" to mean that primitive part of the bronchus above the first collateral branches that are given off, and which, with the corresponding venous and arterial vessels, forms the root of the lung. The collateral branches, with their vessels, form the primitive lung. Only the main bronchus, above the collateral branches, is the essentially surgical portion of the extrapulmonary bronchi, and this part of the bronchial tree can be successfully laid bare and incised only from the posterior mediastinum.

A resection of the fifth, sixth, seventh and eighth ribs (trap-door-flap, or V-shaped flap, with base externally) easily allows the lung to be retracted, either to the right or to the left; and thus permits of exposure of the bronchus, which may then be incised. The bronchus lies about 7 c. m. removed from the chest wall. This bronchotomia postica is a thoroughly justifiable operation. One can open the bronchus from 1 to 2 c. m. from the bifurcation.

The transpleural route can only exceptionally be recommended. The pleura is opened and the finger inserted into the pleural cavity. The lung collapses, and one can feel the bronchus distinctly. In the extrapleural method the pleura is merely pushed aside, a proceedure that can often be easily accomplished without inducing pneumothorax by tearing the pleura.

In a paper on "The Development of Lung Surgery," which I read before the Congress for Internal Medicine (1900), I reported the case of a boy seen by me May 28, 1898, after he had aspirated into his lung a needle, wrapped around with

woolen thread. The child suffered from severe pain, attacks of reflex coughing, and a temperature of 105.8 F. A Röntgen picture showed the needle lodged in the left bronchus, lying horizontally across the seventh cervical vertebra. The left chest posteriorly was dull on percussion. The child suffered from anorexia, was markedly emaciated, and had chills with high fever (104). Under these circumstances, on June 18, I resected the third, fourth and fifth ribs, back as far as the costo-vertebral articulation. In the posterior mediastinum I incised the pleura, which was covered with dirty pus, evacuated a lung abscess, and then drained the cavity. Owing to pre-formed adhesions, a pneumothorax did not result. I could not feel the needle. On the following day, during a severe paroxysm of coughing, the needle was coughed up. I discharged the patient, August 28, healthy and strong.

During that same discussion I called attention to several of my cases, in which I had resected the lung, and which, as long as the smallest fistula remained, could inspire and expire freely if they closed their nose and mouth.

In cases of tumors or of other pathological processes compromising the mediastinal portion of the trachea, I have found the use of especially long tracheal canulæ indispensible, and I always have them ready in my clinic. If we cannot use these canulæ, then death by asphyxia is unavoidable. The patients usually die very shortly after a tracheotomy, from hemorrhage, or from sepsis. My experience, and my experiments with lung resection, teach me that these patients can breathe very nicely through the wound in their lung, and later through the pulmonary fistula. After pneumotomy and pneumo-costopexy we can clamp off the trachea of an animal and see that retrograde breathing through the surface of the lung soon sets in. The wound surface of the lung, which permits respiration, may be surprisingly small. This calls to mind the fact stated by Dubois-Reymond in his lectures. If a duck's thigh is amputated, and then the trachea clamped off, the fowl can still breathe. For the air spaces of the femur are in connection with the lung. The air gets to the lung anti-peristaltically, so to speak, through the canals of the femur.

Only recently, in a case of the most terrible tracheal compression symptoms, I advised making a lung fistula, because all the other known mechanical aids were of no avail. Professors Fränkel and Senator supported me in my opinion. All authors agree that lung wounds are astonishingly tolerant. For

a long while they look like freshly cut lung, in a state of fibrous degeneration, with a protecting layer of granulation tissue, and they withstand various external influences. A permanently formed, well functionating lung fistula does not offer the dangers of a post-tracheotomy tracheal fistula. The attempts to avoid pneummothorax in mediastinal and pulmonary operations or at least to render these conditions less dangerous, will tend to strengthen the idea that the creation of a pulmonary fistula is a life-saving operation. Besides the experiments of Willard-Delorme and Duplay, concerning costo-pneumopexy and pulmonary decortication, we must mention the work of Karewsky, who by the aid of silk sutures soaked, in turpentine, secured pleural adhesions. He passed these sutures, extrapleurally, through the intercostal muscles, with and without rib-resection. We must also mention the experiments performed in von Mikulicz's clinic, to rob pneumothorax of its dangers.

I shall repeat my thesis: In cases of tracheal or bronchial stenosis, where we cannot make use of mechanical aid, and where it is a matter of life and death, a pulmonary fistula should be made.

In benign polypoid and papillomatous tumors, the endolaryngeal method of removal has won great triumphs in the hands of laryngologists. According to Moritz Schmidt, B. Fränkel deserves credit as being the first to recommend this method of removing early diagnosed epitheliomata of the vocal cords. The malignant growths may be removed thus with good results. However, in the large majority of cases, especially where there is a circumscribed tumor with malignant tendency, thyrotomy will continue to be the operation of choice, an operation which has yielded such excellent results in the hands of Butlin and Sir Felix Semon.

In the December number of the "Annales des maladies de l'oreille et du larynx," is an article by Sir Felix Semon, on "Thyrotomie et laryngectomie dans le cancer du larynx," and in the January number of the "International Centralbalatt für Laryngologie und Rhinologie" the same author considers the question of doing away with the tamponade in the wound and the canula in the trachea after laryngo-fissure for malignant endolaryngeal growths.

I must admit that since our endolaryngeal technique has improved I feel that concerning the question of thyrotomy:

1. Careful examination enable us, in a large number of

cases, to recognize carcinoma of the vocal cords, even in the earliest stages.

2. Thyrotomy, in these cases, is not a palliative measure, but a conservative, radical one, blessed by good results.

3. Thyrotomy, without tamponade, and without a tracheal canula, practised in cases of circumscribed carcinoma, is followed by perfect healing, in a surprisingly short time.

My technique in cases of diffuse papilloma of the larynx and in circumscribed carcinoma of the vocal cords is as follows:

(*a*) Median incision from hyoid bone, or the thyroid incisure, to the lower border of the cricoid cartilage, after having first done a low tracheotomy.

(*b*) Incision of the fascia and retraction of the muscles, until the larynx is exposed. Careful hemostasis.

(*c*) Split the conoid ligament and the thyroid cartilage exactly in the median line, with a laryngeal scissors, after first having opened the larynx with a small knife in the middle of the thyroid incisure (the larynx being drawn forward by a sharp hook).

(*d*) Application of a cocain-antipyrine solution (cocain-antipyrine aa 5.0, Aqua dist. 100.0. Carbolic acid 1.0), or of a 1 to 1,000 adrenalin solution in 5 per cent. cocain. Extirpation of all the diseased tissue with knife, scissors and cautery, the larynx in the meantime being well illuminated. Water-tight iodoform gauze tamponade of the larynx, suture of the thyroid. The tracheal canula remains in situ; the patient gets out of bed the day of the operation. Deglutition is not interfered with.

(*e*) In from 48 to 72 hours the tampon is removed, and in from 4 to 5 days the canula. After 12 to 20 days healing is complete. A secondary skin suture is unnecessary.

In tuberculosis of the larynx and epiglottis, where an extensive surgical operation is required, I pursue the following technique: Total laryngo-fissure, exenteration of the larynx, with excision of diseased cartilage, extirpation of the epiglottis, as a final step, free use of the cautery, then iodoform tamponade of the wound and the insertion of a canula. The patients can swallow after this operation without the slightest difficulty.

After about eight days, a little of the cartilage is resected from the fissure of the thyroid and cricoid cartilages.

Total laryngoplasty, using pedunculated flaps, or, where possible, bridge flaps, and fixing them to the mucous membrane of the pyriform sinus, and to the lateral and posterior as-

pects of the trachea by means of accurately applied sutures. One or two sutures also fix the flaps in the depth of the laryngeal cavity. Preferably these flaps are taken from the submental region. If the patient has a beard we must take the flaps from a hairless part of the face. The flaps are also partly secured in place by iodoform packings. After healing occurs, the patient has an artificial laryngoschism which, however, does not interfere with speech, because the two edges of the thyroid cartilage come together. By these plastic operations one can fill out the whole laryngeal cavity with skin grafts, and this skin takes on the character of mucous membrane.

I performed this operation for the first time seven years ago, with excellent result, on a young merchant. He still remains in perfect health. I had removed one of his testicles for caseous tuberculous orchitis and epididymitis. He suffered from pulmonary tuberculosis, with severe dysphagia and dyspnea. In this case I may claim with perfect right that, by means of total laryngoplasty, I formed a new larynx for him. The patient does not wear a canula, but breathes through his laryngo-fissure, seems perfectly well, and attends to business. He speaks in a loud tone of voice, which he can modify, and he can sing the notes of the scale. His cutaneous aditus laryngis is an elliptical slit, about twice the size of a split pea; and thanks to the fact that the expired air causes the free edges of this slit to vibrate, he can speak excellently well and loud. Had the slit been too wide he would at most have been able only to whisper. In other words we here have a case of laryngeal tuberculosis, treated as a local tuberculosis, and as a result, permanent healing was secured.

I shall now describe the technique of a hemilaryngectomy. If a preliminary tracheotomy has not been done, and the patient is not dyspneic, I proceed as follows: Median incision from hyoid bone to lower edge of cricoid. Ligation of hyoid and cricothyroid arteries. Constructing of a rectangular flap by two incisions, at right angles to the ends of vertical incision on the diseased side of the larynx. Flap dissected backward so that inner border of sternomastoid is exposed. Diseased side of larynx dissected bare, under careful hemostasis. Superior laryngeal artery clamped before it enters larynx, the horn of the hyoid bone cut away, and then the artery ligated and divided. Thyroid gland retracted downward, or, if necessary, a part of the struma may be resected. The soft parts are dissected away from the larynx by means of blunt dissection.

Only after all bleeding has been arrested and the half of the larynx has been dissected free as far as the median line posteriorly, do we proceed to the resection. Now we make a tracheotomy opening and insert a Hahn's tampon canula; or we can avoid this by operating with the patient in the "hanging head" position. Total laryngofissure is now done as the final act of the operation. Cocaine-adrenalin solution is applied to the laryngeal mucosa. Now the thyrohyoid membrane and and mucous membrane of the diseased side are split, the ligament and mucous membrane between thyroid and cricoid cartilages also split transversely as far as the median line. Finally the posterior wall of the fully mobilized larynx is divided (being scrupulously careful to avoid wounding the esophagus) and the diseased half is removed. We now place our original skin-flap in position, so that it is applied to the wound edge of the mucous membrane of the sinus pyriformis above, to the trachea below, and in the median line, to the remaining half of the larynx. Any defect in pharynx or esophagus must be first carefully repaired. We may use a second tongue-shaped skin-flap, taken from the hyoid region (base upward), to turn down into the larynx and fix there, so as to close the wound off from all communication above. The larynx space is now carefully packed with iodoform gauze. A thin stomach tube is inserted into the esophagus, through the nose, and remains in situ until the patient is allowed to swallow. Gauze strips are packed around the canula opening to drain the tracheotomy wound. Of course, the operation can be done without any plastic skin-flaps, but I hold them to be of great importance in avoiding aspiration pneumonia. Moreover, after healing has occurred, the skin-flaps serve in large measure to take the place of the removed portion of larynx.

The laryngoschism is in no way disturbing; it can be done away with whenever it is so desired. I always argue against doing away with it, however.

In cases of primary carcinoma of the epiglottis, I start out with a subhyoid pharyngotomy. An incision opposite the lower border of the hyoid bone lays the epiglottis bare. The mucous membrane is divided at the upper edge of the thyroid cartilage and the epiglottis is cut off at the base with a thermo-cautery.

In one case I extirpated the epiglottis, hyoid bone and base of the tongue together. I shall say more of this later.

I should like to mention one important point, viz.: after ex-

tirpation of the epiglottis and base of the tongue, for carcinoma, the patient must wear a tracheal canula. If the operation was extensive there is great danger of aspiration pneumonia. Even tamponade of the wound does not surely guard against it. We believe that in such cases we can surely guard against aspiration pneumonia by (*a*) Careful tamponading of the larynx, through the aditus; (*b*) suturing the tampon in place, so as to fix it securely; (*c*) temporarily closing the aditus of the larynx by a plastic operation. I shall describe my technique for these operations, but I must add that it has been modified a great deal during the last two years, although it gave good results formerly.

In cases where tracheotomy has been performed, or in cases where it has not been necessary, we do not start in with resection of the trachea, but do this at the end of the operation, after the larynx has been dissected free, and mobilized. With the patient in the hanging head position, we divide the larynx from its connections to hyoid bone and then draw larynx and trachea out of the wound. Strong sutures are passed through the trachea and then this organ is divided transversely above the sutures and below the cricoid cartilage. The tracheal stump is then sewed in the wound.

The method which I am going to describe now must be used under certain circumstances:

Case 1. Total extirpation of larynx and epiglottis, resection of pharynx and extirpation of diseased lymph nodes.

1. Incision. Two horizontal incisions, extending from the middle of the right to the posterior border of the left sternomastoid. The upper incision is on a level with hyoid bone, the lower one just below cricoid cartilage. These two incisions are connected by a vertical incision, made along the posterior border of left stermomastoid. The skin-flap is then dissected back.

2. Larynx dissected free. Left sternomastoid divided transversely at level of both transverse incisions. Omohyoid muscle divided where it emerges from under the sternomastoid. Then I try to free the adherent lymph nodes and muscle from the vessels by blunt dissection. This is easily done as regards the carotid artery, but with the jugular vein they are often so densely adherent that the vein has to be resected with the mass. Now the sternohyoid and sternothyroid muscles are cut across on both sides, on a level with the lower border of the cricoid cartilage. Ligature of the thyroid artery. Incision of the tough fascial layer, which lies in front of the trachea, and re-

traction of the thyroid isthmus downward, until the first four tracheal rings come into view. Lateral aspect of these four rings dissected free. Posterior surface of trachea allowed to remain undisturbed. Sternohyoid, omohyoid and thyrohyoid muscle insertions to the hyoid bone divided, and the right and left superior laryngeal artery tied off and divided.

3. Division of the trachea. Cricotracheal ligament divided, and then two guide sutures are passed through the anterior wall of the trachea. By traction on these and on the sharp hook inserted in the lower border of the cricoid, the tracheal wound is made to gap. Now the trachea is divided from the cricoid along its whole circumference and the esophagus is peeled off the trachea for a distance of two centimeters by blunt dissection. The tracheal stump can now easily be drawn to the level of the skin. Its anterior circumference is sutured to the skin with a few matrass sutures. The rectangular skin-flap is now placed in position and the posterior surface of the trachea is sutured to it. Thus the tracheal opening is surrounded on all sides by skin. The anesthetic is now administered through the tracheal canula.

4. Extirpation of the larynx. Crowd in over the hyoid bone, and divide on both sides, the insertions of the mylohyoid and geniohyoid muscles, as well as the median and lateral glosso-epiglottic ligaments. Thus we enter the pharyngeal space, in front of the epiglottis. Mouth is completely tamponed with gauze, through the wound. With bone scissors the hyoid bone is divided on both sides, just median to the insertion of the digastric muscle. Now, if one retracts the hyoid bone upward he obtains a good view, from above, of the posterior surface of the epiglottis, the sinus pyriformis, and the aditus laryngis. One could see the carcinoma, in my case, situated on the left side, and involving the whole sinus pyriformis, base of the epiglottis, and any epiglottis ligament. Thyrohyoid membrane divided from the horns of the hyoid bone on both sides, cutting through the mucous membrane at the same time. Division of the inferior constrictor muscles of the pharynx and the mucous membrane over them. Finally, the anterior wall of the esophagus is divided on a level with the upper border of the thyroid cartilage; then the anterior part of the esophagus is separated from the posterior wall of the pharynx, by blunt dissection.

5. Closure of the wound. The closure of the esophageal and pharyngeal wound is very difficult, owing to the fact that there

was a good deal of tension on the sutures which were used to bring the anterior wall of the esophagus up to the base of the togue. We can always succeed however, in closing the defect in the horizontal direction. A vertical suture in my case was impossible because there was not enough of the posterior pharyngeal wall left. Before suturing the mucosa a small stomach tube was slipped into the esophagus through the nose. The suture line was reinforced by sewing the muscle stumps and fascia over it. The upper lobe of the thyroid was also used to strengthen the suture line. Then the skin-flap was sutured in place all around, that part of it around the tracheal stump having already been sutured in place. Two gauze drains were placed under the flap and brought out at the lower angle. Light compression bandage.

CASE NO. II. Tumor which is said to have taken its origin from left aryepiglottic fold, and which now extends to left pharyngeal wall, as high up as the tonsil, filling in the sinus pyriformis and extending downward around the esophagus. One can just reach the lower border of the tumor, palpating through the mouth, with the index finger.

1. Operation. Laying the larynx free anteriorly. Median vertical incision, beginning a little above the hyoid bone and running as low down as the jugulum. Skin and fascia divided. The thick layer of fascia which runs from isthmus of thyroid to cricoid cartilage is divided horizontally, and the isthmus is retracted downward, exposing the first few tracheal rings. Ligation of cricothyroid artery.

Transverse incision, through skin and platysma, reaching to the inner border of both sternomastoids. Anterior jugular vein ligated. Sternohyoid, thyrohyoid and omohyoid muscles divided just below the hyoid bone. The sternothyroid is divided at its insertion in the thyroid cartilage. The muscle stumps remain in connection with the skin-flaps, on both sides, which are retracted outward. Both upper poles of the thyroid gland seemed to be involved in the tumor mass. Both superior thyroid arteries ligated and divided. Both upper poles of the thyroid gland were resected, and the bleeding surfaces sutured. The lower half of the thyroid was pushed away from the cricoid cartilage and trachea by blunt dissection. Superior laryngeal artery ligated on both sides, just as it enters the thyrohyoid membrane. Now the entire anterior surface of the larynx was free.

2. Separation of larynx from hyoid bone. Transverse di-

vision of pharynx, with patient in hanging head position. The hyoid bone is drawn forward and upward by means of a sharp hook, and the thyrohyoid membrane is cut close to its hyoid attachment. Then, by small incisions along the upper and posterior surface of the hyoid bone, the pharynx is opened between the base of the tongue and the anterior surface of the epiglottis. The incision is enlarged laterally along lower border of hyoid bone, to where the lateral thyrohyoid ligament is attached. Now one can draw the aditus of the larynx upward, allowing the patient to breathe freely, and yet guarding against the aspiration of blood into the trachea. The thyrohyoid ligament is cut through on both sides; one now works toward the median line, from the internal carotid artery, crowding into the loose connective tissue, from behind the posterior pharyngeal wall forward. With the finger of the other hand work in the same manner until both fingers meet. Now the entire pharynx will be free. The hemorrhage is very slight, and easily checked by packing.

3. Resection of esophagus and trachea. While the larynx is being pulled gently upward and forward the posterior pharyngeal wall and esophagus are loosened from their base, with the finger, until we get as far downward as the first tracheal rings. We have now reached the lower border of the tumor. Now the larynx is drawn sharply forward, so as to pull the trachea up to the level of the skin wound. Now a needle, threaded with a stout suture, is passed through the skin, tracheal wall, and back through the skin 1 c. m. removed from the point of entrance. This same plan is repeated on the other side. Two iodoform strips are now laid between trachea and skin, and the sutures are tied over it. Above the sutures, the trachea and then the esophagus are cut transversely across.

4. Extirpation of the remainder of the tumor from the lateral aspects of the pharyngeal wall. Divide the hyoid bone through its center. Retract the left half forward and outward, and we can now see the upper border of the tumor well (with patient in hanging head position). Circumscribe the tumor well into healthy tissue, and then complete the extirpation by blunt dissection, getting the finger behind the tumor and shelling it out from above. The left half of the hyoid bone is removed with the tumor.

5. Care of the wound. Ordinary canula is put in the trachea, and a soft stomach tube in the esophagus, which is led out of the wound anteriorly. Iodoform gauze is packed all around

the esophagus stump. The anterior part of the esophagus is united to the posterior part of the trachea by a few sutures. The mucous membrane of the base of the tongue and the lateral pharyngeal wall are united to the skin of the upper part of the wound, as far as it is possible to do this. These sutures should be tied over strips of iodoform gauze. A large, rather firm ball of sterile gauze serves to wall off the wound from the mouth and its secretions. The ball is held in place by a few sutures, passed through the wound edges.

In cases where we have removed larynx, epiglottis, root of tongue, and anterior and lateral walls of pharynx, and where we have anchored the tongue stump to the skin of the submental region, we do not perform a plastic operation at the same sitting, but wait, say four to six weeks, until the defect has been closed by provisional cicatrix formation. During the process of healing the defect contracts a great deal, eventually assuming the form of an equilateral triangle, with its apex pointing upward. The floor of this triangle is formed by the posterior pharyngeal wall. The sides of the triangle are cicatrized to the skin, along two lines, corresponding to the inner margins of the sternomastoid muscle. The base of the triangle is formed by the cicatrix between the stump of the tongue and the skin under the chin. The apex of the triangle is formed by the stump of the trachea, behind which lies the opening of the esophagus.

The cuff of skin behind the trachea is now freshened up by careful dissection, that is, by a dissection which freshens the apex of the triangle. A horizontal incision is now made through the skin, extending outward from the end of one of the limbs of the triangle. This incision is 3 to 4 c. m. long. Another one is then made parallel to it, and the two ends of these incisions are joined by means of a vertical incision. A rectanglar skin-flap is thus outlined. This flap is raised and turned over (epidermis side inward) against the posterior pharyngeal wall.

Similar incisions are now made, extending outward, from the two ends of the other side of the defect. The rectangular flap, so outlined, is then dissected back. The cicatrix joining the base of the tongue to the skin is now freshened.

The flap first made is turned in so that its epidermal side faces inward. Above it is sutured to the substance of the tongue, below to the defect in the anterior esophageal wall;

while its free edge is sutured to the edge of opposite side of the wound.

The second flap is then turned in so that its raw surface covers over the reconstructed pharyngeal defect, and it is fixed in place as follows:

1. The lower edge of the flap is sutured to the posterior edge of the tracheal stump.

2. The upper edge is sutured to the upper part of the defect, in the chin region.

3 The lateral edge is sutured to the wound edge of the side opposite to the one from which the flap was taken.

A stomach tube is inserted into the esophagus, through the nose. A tracheal canula is inserted, and a light compression bandage applied.

In doing a complete laryngectomy, a rectangular flap is made, the incisions being situated over the hyoid bone and cricoid cartilage, extending transversely from one sternomastoid muscle to the other. The ends of these two horizontal incisions are connected by a vertical incision, and then the whole flap is turned back. A transverse incision 4 c. m. long is then made in the jugulum, and the bridge of tissue extending from this incision to the previously made flap is dissected free from the underlying tisue. After the larynx has been extirpated the tracheal stump is brought under this flap and sewed into the wound in the jugulum by means of an accurately applied circular suture. In order to sufficiently mobilize the tracheal stump so that it may be drawn into the lower angle of the wound, the fascia must be split in the mid-line of the lower part of the neck. It is entirely unnecessary to fix the posterior tracheal wall to the anterior wall of the esophagus, for it is exactly at this point that fistulæ occur so readily and so frequently, causing very disagreeable symptoms.

I attempt rather to keep the trachea well separated from the pharynx and esophagus by a barrier of tissue, preferably by a well-nourished skin-flap, which covers the pharynx and esophagus, just as the external skin-flap covers the trachea. By this method we secure a safe cicatrization around the trachea, as well as around the pharynx and esophagus. The wound in the pharynx must be accurately sutured, and the skin-flap sutured in place over it. I do not make a preliminary tracheotomy unless it is urgently indicated to do so on account of severe dyspnea.

With the patient in Rose's position, a stout silk suture is

placed in the median line, just beneath the hyoid bone, and another one is passed through the thyroid incisure of the thyroid cartilage. These are then held tense, and the laryngeal cavity is opened by a transverse incision, made between the two sutures. The larynx is then drawn anteriorly, and a small canula is sutured into it. Extirpation of the larynx then follows. As soon as the laryngeal cavity has been opened the pharyngeal mucosa is incised along the posterior circumference of the larynx, the knife being held perpendicular to the laryngeal wall. The pharyngeal mucosa is then carefully separated from the posterior laryngeal wall, each bleeding point being caught and tied off.

The trachea is now pierced in the median line and laterally, at the level of the second ring, with strong silk sutures. These are held tense and, the larynx is divided from the trachea, at the level of the cricoid cartilage, unless the disease extends further down than this, in which case the division is made at the lower level.

The edges of the pharyngeal mucous membrane are grasped with artery forceps, and then sutured together over a small stomach tube, that has previously been inserted into the esophagus through the nose. Another row or two of sutures are then passed through the muscular pharyngeal coats. All bleeding vessels are then tied off, and the wound packed with iodoform gaude. The skin-flap is fixed over the pharyngeal defect with two or three matrass sutures, and a light compression bandage is applied.

Thus we see the larynx is laid bare on its anterior and lateral aspects, and the muscles cut off close to their laryngeal attachment. The thyroid gland is retracted from the larynx, downward, and to one side; the superior laryngeal artery is tied off on both sides, just before it enters the larynx. I then place the patient so that his head hangs over the edge of the table, and I divide the ligament between the thyroid cartilege and hyoid bone. I then lead a gauze tampon from the wound, upward into the pharynx, so as to avoid infecting the wound with saliva. The larynx is then drawn forward and freed from its esophageal attachment, until the entire larynx is freed as far down as the cricoid cartilage, so that it can be drawn forward and freed from its esophageal attachment, until the entire larynx is freed as far down as the cricoid cartilage, so that it can be drawn forward into the wound. Then a 5 c. m. horizontal incision is made in the jugulum, and the skin is

dissected free from the fascia, up as far as the first incision, thus making a skin bridge flap about 5 c. m. wide. Then I transfix the trachea, just below the cricoid, with two strong silk sutures, divide the trachea just above these sutures, and then, by traction on the sutures, draw the tracheal stump under the bridge flap, into the the wound in the jugulum. The tracheal stump is then sewed permanently to the skin edges of this wound. The pharynx is then carefully sewed, so as to prevent the escape of saliva into the wound, all pockets are packed with iodoform gauze, and the skin is sutured. The patient is fed through a stomach tube, introduced through the nose.

In order to extirpate the pharynx with the larynx, I make a median incision, lay the whole larynx bare, and then put the patient in Rose's position; then I incise the ligaments between the hyoid bone and the larynx and draw the aditus laryngis forward. The interior of the pharynx is now well in view, and I can easily cut away the anterior and lateral parts of the larynx, between clamps and ligatures. Then I free the pharynx and esophagus from the vertebral column far enough to permit a complete excision of the tumor. I then divide the esophagus as far as possible below the tumor, and then free the anterior surface of the esophagus from the trachea. Then the larynx is extirpated, just as I have previously described. I then protect the wound against mouth secretions, by a suture of the pharyngeal wall, or by iodoform tampons, in case the pharynx has been extirpated very high up. The patient is fed as before described. The wound is packed with iodoform gauze and the skin is sutured over it.

The suture of the pharynx is very important. For if one packs the wound with iodoform gauze without closing off the pharynx the patients are tormented by unbearable reflex symptoms, and, as a result, they produce enormous quantities of a ropy mucus. The reflex symptoms, and the mucus production are absent when the pharynx is sutured. If only a partial suture can be made, even then it is possible to arrange the tamponading of the wound so that the gauze causes no reflex symptoms, viz.: by keeping it entirely extrapharyngeal. In some cases the thyroid lobes must be removed with the larynx. In these cases the superior and inferior thyroid arteries must be tied off, or else the lobe resected after applying clamps or ligatures. The ascending pharyngeal artery can be ligated and divided during the pharyngectomy.

It is surprising how safely, bloodless and clean the operation is when done according to these principles. I have, indeed, in some cases, resected the esophagus as low down as the mediastinum, held the esophageal stump in place with artery forceps, carefully packed off the posterior mediastinum, introduced a stomach tube in the esophageal stump, and held it there with sutures. In still other cases, employing the same method, I have had to resect the base of the tongue.

In cases of malignant tumors, where the pharynx and larynx have to be sacrificed, one can do it with the greatest possible safety, through a simple median incision, as I have just described; moreover, the esophagus and the hypopharynx can be resected, as high up as the base of the skull, with no need of resection of the jaw.

When the tumor is located elsewhere, naturally, the present methods of pharyngotomy (subhyoid, median or lateral), or of Kocher's normal incision, must be practised.

In cases requiring an extensive radical operation, I can most warmly recommend this new method of operating. If more radical work has to be done, it is advisable to make a temporary tracheotomy and to close off the larynx space entirely, either by suture, or by tampons. We must also create an organic diaphragm, to separate the wound from all mouth secretions. If carcinomatous lymph nodes must be removed I proceed differently, according to whether they are adherent to the larynx or movable. I remove movable nodes through a separate incision, made along the anterior border of the sternocleidomastoid. Through such an incision one can remove nodes, and a portion of the internal jugular or cartoid, if necessary, without establishing any communication with the laryngectomy wound. Morover, the wound heals per primam. This is important, for if ligated vessels or their stumps lie exposed in a suppurating wound, the patient may have a hemorrhage at any time. If the nodes are adherent to the larynx I remove them with the larynx. If one has to deal with large lymph-node tumors, requiring the extirpation of adherent muscles or vessels, it may be necessary to add to the longitudinal incision, by making incisions transversely. In such cases I try to protect the vessels or their stumps by sewing skin-flaps over them, thus guarding against erosion of the vessels and subsequent hemorrhage.

To sum up then, the extirpation of larynx and pharynx is done as follows:

1. Longitudinal incision from hyoid to cricotracheal ligament.

2. A 4 to 5 c. m. horizontal incision, one finger's breadth above the jugulum, and a tunneling of a bridge flap up to the lower end of the longitudinal incision.

3. Sharp and blunt dissection of the larynx, freeing it from all its attachments, with careful ligature of all bleeding points.

4. Ligation of both superior thyroids before they enter the larynx. Division of both corners of the thyroid cartilage with laryngeal scissors.

5. Thyroid gland carefully dissected back, and, when necessary, the upper pole resected after application of ligatures.

6. When infiltrated nodes are felt under the muscles, laterally to the larynx, the muscles must be sacrificed.

7. The pharynx is treated similarly. First ligate the ascending pharyngeal artery, if it happens to be injured during the operation. Sometimes the superior thyroid must be ligated on one or both sides, in case a portion of the thyroid has to be resected.

8. Temporary packing of the wound. Patient placed in Rose's position. A stout silk suture is passed in median line of thyroid incisure, just under the hyoid bone.

9. Opening of the thyroid, just at the border of the thyroid cartilage. Careful grasping of the mucous membrane with clamps. Cocain-adrenaline application, to check reflexes and bleeding. Inserting of a small canula into larynx, where it is held in place by sutures.

10. Careful resection of the pharynx back to the spinal column; cutting only between clamps or ligatures.

11. Careful suture of the upper pharynx stump.

12. By blunt dissection, the pharynx and esophagus is dissected free from the spinal column, until healthy tissue is reached.

13. Transverse division of the trachea, below the larynx, after the already described tracheal sutures have been passed. Treatment of the tracheal stump as in laryngectomy. In separating the esophagus from the hypopharynx, or in cutting through the esophagus at a lower level in the mediastinum, the esophagus walls are temporarily fixed by means of clamps. Likewise is the stomach tube fixed in place in the esophagus by means of sutures. Now comes a general revision and a final checking of the bleeding with hemostatic sutures, where necessary, packing the wound with iodoform gauze, suture of

the skin, and the application of a light compression bandage.

The patient is instructed not to practise any movements of deglutition, and to expectorate all saliva and mucus. Mouth, tongue and teeth are kept scrupulously clean by being frequently wiped off with a one-half per cent. solution of aluminum acetate.

The patient must sit up or get out of bed the day after the operation, in order to avoid a hypostatic pneumonia.

I never use the Trendenberg or Hahn canula; and by not using them I avoid trauma to the tracheal mucous membrane, and consequent tracheobronchitis. An aspiration pneumonia can be ruled out absolutely, for neither during the operation, nor during the after treatment, does a single drop of blood or wound secretion get into the air passages.

It is very important for the success of the operation that the stomach be absolutely empty. I operate in Rose's position (hanging head), so that if the stomach were not empty the gastric contents would run right out through the esophagus, into the wound, dangerously infecting it.

In cases where only a tracheatomy is possible, or where recurrence renders deglutition impossible, we do not hesitate to proceed according to Helferich's recommendation, and to make a gastrostomy opening.

Concerning the prognosis regarding length of life in laryngeal and pharyngeal carcinoma, I know of patients who were treated for years before the diagnosis of carcinoma was firmly established. In other cases, two to three years have elapsed. Other patients, in addition to their carcinoma, had large papillomatous growths, which were removed by the endolaryngeal route, and which complicated the diagnosis. Langenbeck has called attention to the fact that in malignant growths, for example, of the superior maxilla, the mucous membrane of the antrum of Highmore was often the seat of diffuse papillomata The carcinoma may exist a longer or shorter period before it is diagnosed, causing either severe or trivial subjective symptoms.

Fairly large carcinomata may be situated on the petiolus of the epiglottis, and not cause very severe symptoms. Retrolaryngeal carcinomata may degenerate, become putrid, and be accompanied by lymphatic metastases, without causing severe symptoms. On the other hand, very small tumors may cause intensely severe symptoms by inducing swelling and edema,

difficulty of respiration or deglutition, hoarseness and hemorrhage.

The fate of the patient, we must all agree, depends upon early diagnosis and radical operation. We agree absolutely with Sir Felix Semon's dictum: "I am certain that the prospects of cure in an early operated laryngeal carcinoma are as good, if not better then, for carcinoma situated anywhere in the body." I wish this consolatory thought would receive wide-spread recognition. Unfortunately, the microscopic examination of small curettings is often unsatisfactory.

The pathologist demands portions of the deeper part of the tumor before he will make a positive diagnosis, and in order to get these deeper parts a resection of the larynx is necessary. So it is often impossible to secure a positive miscroscopic diagnosis before operation, and neither the physician nor the patient cares to advise operation on a tentative diagnosis.

The laryngoscopic examination is also often deceptive. A carcinoma may be taken to be merely a mild affection of the mucous membrane. These are tragical surprises which happen to the most experienced men, and which give rise to mental reservation, as regards results, in every case of laryngeal carcinoma that is operated upon.

There are cases in which, from the first symptom until death, only one and one-half years elapse. In other cases the diagnosis is made, the patient refuses operation, and in from six months to a year later is in such a condition that tracheotomy is necessary.

After the tracheotomy a year may pass before difficulties in deglutition and necrosis of the tumor gradually usher in death. Thus the duration varies, according to the position, character and rapidity of growth of the tumor, provided no operative interference is instituted. Lymph node involvement in the neck develops comparatively late in endolaryngeal carcinoma. Metastases also develop relatively seldom.

In order to make clear the difficulty of exact diagnosis in laryngeal carcinoma I shall cite two cases, referred to in the thorough work of Prof. B. Fränkel.

In the first case Fränkel diagnosed a pachydermic swelling on the right cord. In the course of three months the swelling had increased in size, from before backward, and in thickness. The microscopic examination showed epithelial strands going deeply into the connective tissue, in places with no well marked border; but there were no epithelial pearls. This find, if it

did not definitely speak for carcinoma, was at least very suggestive of it. After an endolaryngeal removal of the growth a recurrence occurred in two months. Another microscopic examination now showed undoubted carcinoma. Laryngofissure was now performed by Prof Hahn, who removed the right vocal cord and the right vocal process. Uncomplicated healing took place, and now, five years later, the patient is entirely well and has a fairly good voice.

In case 2 Fränkel also made a diagnosis of pachydermia diffusa, with nodule formation. Three months later a microscopic examination of the growth, which had progressively increased in size, showed undoubted carcinoma. The diseased cord was removed by laryngofissure, and complete healing occurred, a fact which was confirmed two years later, when an autopsy was performed on the patient. The patient died of a primary adeno-carcinoma of the intestine; in other words, this is one of the cases of an individual suffering from two carcinomata. The autopsy showed the larynx to be free from every suspicion of a carcinoma.

These two cases show that carcinoma can develop from pachydermia of the cords. The cases illustrate the difficulty of diagnosis in endolaryngeal tumors.

Clinical observation leaves us in doubt in many cases as to whether the tumor in question is carcinomatous or not. In such cases we can assure ourselves of the diagnosis only by removing a portion of the tumor by the endolaryngeal route, and submitting it to microscopic examination. But even after using this method we are often left in doubt concerning the diagnosis. The following points, according to Fränkel, speak in favor of carcinoma: Atypical epithelial strands, which dip down deeply into the connective tissue, and which divide into branches. These strands show an irregular structure, an absence of cells with basal nuclei, and an indistinct border separating them from the neighboring connective tissue. If, in addition to this picture, we see conglomerate masses, resembling giant cells and epithelial pearls, then the diagnosis of carcinoma is practically assured. The microscopic diagnosis of carcinoma is strengthened if we find atypical epithelial alveoli lying in the connective tissue, and having no connection with the surface epithelium. In order to make a diagnosis of carcinoma of the larynx, we must have a piece of tissue which shows not only the epithelium, but also the deeper connective tissue, therefore, in removing a piece for examination, one should be careful

to remove more than just the superficial portion. In papillomata there is a moderate thickening of the epithelium, which grows towards the lumen of the larynx, and is marked off from the underlying connective tissue by a well-marked row of basal cells and a sharp border.

The diagnosis is most difficult in certain cases of pachydermia when epithelial strands are given off. Here we must be governed by the character of the epithelial cells and the boundary between epithelium and connective tissue. Whether or not in very difficult cases we should resort to exploratory thyrotomy, in order to clinch the diagnosis, the discoverer of the endolaryngeal method does not state. From the general surgical standpoint it is a method that merits earnest discussion.

It is very important to definitely limit the meaning of the term "radical operation." The larynx, and in particular, circumscribed, endolaryngeal carcinomata of the vocal cords, are, within certain limits, structures "sui generis." In every case we must ascertain in how far we are justified in instituting conservative methods. The general surgical conception of radical operations has taught a different lesson concerning malignant neoplasms than we have learned from laryngeal, circumscribed carcinomata. Let us take uterine carcinoma, for example. This in its first stages is a circumscribed disease, amenable to surgical treatment. Cure can be promised if the growth is limited, whereas later only palliative treatment is possible. In order to perform a radical operation, we must not only remove the tumor, but also all the tissue, through which the disease might have extended, pelvic and vascular cellular tissue, pelvic and lumbar lymph nodes. Such an operation can be performed only by the abdominal route. Every other attempt at a cure must be considered as incomplete and palliative.

The anatomical character of the tumor, whether it be a medullary or scirrhus tumor, is of importance, but of much more importance than this is the location of the tumor. Turning his attention to the structures of the neck, every surgeon will admit that in carcinoma of the vocal cords we can get permanent cures by excising the growth with some surrounding healthy tissue, provided the diagnosis is made early. With the pharynx and cervical portion of the esophagus, conditions are different, owing to the lymphatic apparatus, and here we must recognize that even small tumors must be removed very

radically by means of an extensive operation in order to surely rule out a recurrence. Thus, frequently enough, in dealing with a tumor of the pharynx or esophagus we have to remove the larynx and the outlying healthy tissue, in order that the operation be truly a radical one. I remember in particular a case in which Prof. Julius Wolff removed the larynx. The patient died four and a half years later of carcinoma of the lungs, after having suffered first from a spontaneous fracture of the femur, due to carcinoma of that bone. In the scar and about the neck there was no sign of recurrence. In pharyngeal and esophageal tumors conditions are very favorable for metastases, both local in the cervical lymph nodes and general throughout the body.

Laryngeal carcinomata are either primary or secondary; the latter are by far the more uncommon, and usually occur as growths of contiguity from neighboring pharyngeal growths. The most frequent form of laryngeal carcinoma is the epithelioma (carcinoma platicellulare or keratodes). The medullary carcinoma are rarer and less dangerous. A third variety is the scirrhus. Occasionally we come across an adernocarcinoma. Epitheliomata occur mostly in the interior of the larynx, although medullary carcinomata may occur here also. The polypoid carcinoma may be considered as a special form. Diffuse carcinomata occur equally frequently in the larynx and in the pharynx. The carcinomata that occur in the ventricles of the larynx are very important. The larval form of carcinoma takes its origin in the depth and grows very slowly, so that when we diagnose it by seeing the surface the larynx may be largely destroyed and the case inoperative. I should like to cite the case of a larynx in whose interior an epithelioma developed, while on the other side of the retro-laryngeal mucous membrane a polypoid carcinoma grew.

The early stage of a laryngeal carcinoma may be a pedunculated tumor, with a fairly broad base. They remain stationary very often for years, and can be removed (seldom, it is true) by the endolaryngeal route or by laryngofissure.

In other cases the growth is rapidly progressive. The tumor attacks the submucosa over a large area, and in these cases we must resort to radical operation.

Symptoms, such as hoarseness, pain (radiating to the ear), and difficulty in deglutition may occur with other diseases (tuberculosis, syphilis, etc.). Dyspnea, cough, fetid breath, increased secretion, salivation, bleeding, putrid ulceration and

necrosis, and softened lymph nodes are sure signs of carcinoma, but when they are present there is little hope of effecting a cure. The periods in the course of the disease are as follows: First period, formation of the tumor; second period, ulceration; third period, destruction, necrosis and putrefaction. Our aim should be to recognize the disease during the first stage.

I take the following position: If the carcinoma occurs and runs its course as a local disease, then it ought to be possible to treat it in this stage by local treatment. Virchow expressed this opinion, and every surgeon should heed it.

I cannot see why the pathologist and surgeon should not advise exploratory laryngofissure in all those cases where the microscopic examination leaves a particle of doubt concerning the malignancy of the disease.

The question has often been discussed of the advisability of deliberately shortening the lives of patients suffering from this terrible disease. I consider the prolongation of life to be the most honored task of the surgeon. For example, in gastric carcinoma, a gastro-enterostomy not only prolongs life five months, but relieves the patient of his terrible pains. In addition to prolonging life the operation provides for euthanasia, and this is a solemn duty that we owe to the patient.

Primary carcinoma of the cords, when operated upon, offers a good prognosis, and the same is true of carcinoma of the epiglottis. If the carcinoma occurs in any other position of the larynx, then a local excision is of doubtful value, and we must resort to a more radical operation.

Of the endolaryngeal carcinomata, the glandular variety is more malignant than pedunculated or broadly sessile tumors of the mucous membrane. They often are not diagnosed for a long while, and offer a bad prognosis even when subjected to radical operation. Small pharyngeal tumors often cause enormous lymph node tumors.

Regarding recurrence, one can make only a tentative prognosis. I have seen cases of endo-laryngeal tumors where everything looked favorable, and yet, where, after operation, terrible recurrences occurred. On the other hand, I have seen cases of from four to six years' duration, after extensive operations for endolaryngeal tumors, with resection of the tumor, lymph nodes and vessels. In one case of carcinoma of the epiglottis and base of the tongue, a subhyoid pharyngotomy was done; despite profuse hemorrhage, perfect healing occurred, with perfect function, three weeks after operation. No canula was

used. A year later a lymph node metastasis was removed, after a four and one-half hour operation. Since then four years have elapsed, and the patient remains in the pink of condition. In a similar case, of a very small carcinoma of the base of the tongue, in a 68-year-old man, we removed an enormous secondary lymph node metastasis of the neck, which was adherent to the external and internal carotids and the internal jugular vein, and which extended from jugular to the base of the skull. Primary union resulted in three weeks. The patient refused to allow the tumor on the base of the tongue to be removed. He felt well for eight months, and the laryngologist who treated him wrote me that the tumor grew smaller. Later, however, the steady growth of the carcinoma killed the patient. We cannot explain the anomalous course that the disease took in this case, the tumor apparently ceasing to grow for a while, and then taking on growth again later. Regarding the danger of a radical larynx operation, we can only say that it shares with all other capital operations the dangers of anesthesia, shock, etc.

Diabetes, heart disease and old age are no direct contraindications, and I have repeatedly operated under these circumstances with success. A suddenly occurring and uncontrollable diarrhea, with collapse, sometimes start up in old people, even after the wound has healed. Such a state of affairs usually arouses a suspicion that we are dealing with a case of cirrhosis of the liver. I have observed one such case, where the diagnosis was confirmed by autopsy.

Sometimes an uncontrollable intestinal hemorrhage occurs after operations on the neck, larynx and pharynx. These hemorrhages are not necessarily due to carcinoma of the intestine, but may be due to venous congestion. Ligature of the carotid artery may cause hemiplegia of the opposite side of the body. Resection of the vessels of the neck may be followed immediately by unconsciousness, which later ends in death. In a series of cases healing progressed beautifully despite resection of the vessels, the vagus, and other cervical nerves. If the temperature rises immediately after the operation, and the pulse ranges from 130 to 140 and is irregular, then we must think of sepsis, iodoform intoxication and delirium cordis. In such cases we remove the bandage at once, take out the sutures and gauze, and repack with sterile gauze, or with a wet aluminum acetate gauze. Internally we give valerian,

camphor and tincture of strophanthus, combined with oxygen inhalations and alcohol massage to the body.

Bronchitis we treat with moist packs, inhalations and frequent changes of the canula. An unexpected stoppage of the heart may occur within thirty-six hours after the operation, or three or four weeks later, after the wound has healed. I have been unfortunate enough to have such cases.

Emboli, such as we see after extirpation of the rectum and other pelvic operations, practically never occur after larynx operations. In general we allow our patients to sit up on the day of the operation.

The bandage and tampon is removed after six, eight or ten days. We change the canula only when the temperature and pulse indicate that a change is necessary. The patient is instructed to expectorate everything, and never to swallow. Nourishment, the digestion of the patient, cleanliness, hygiene of the sick-room, are all very important points. Day and night nurses are indispensible. After the first wound dressing the dressing is changed every twenty-four to forty-eight hours. We have avoided mediastinitis, even in cases where there was extensive necrosis present.

Where we have had to practise thyroidectomy we have seen myxedema, of a severe type, which disappeared permanently under treatment with thyroid extract. Profuse salivation and conical dilatation of the esophagus stump, with edema of the mucous membrane, are disagreeable complications. We have also repeatedly seen symptoms of irritation of the vagus manifested by attacks of reflex coughing and singultus.

Regarding the pathology of the tumors we have seen: One case of chondrosarcoma of the left part of the thyroid cartilage in a 12-year-old girl. After hemilaryngectomy the girl has remained cured for four years. One case of sarcoma of the cricoid in a 22-year-old pregnant woman. She has been cured for four years. In a 27-year-old woman we extirpated almost the whole larynx for a cavernous sarcoma. She has been well for nine years now. In another case we removed a cavernous sarcoma of the root of the tongue and the left sinus pyriformis A 54-year-old man, on whom I did a hemilaryngectomy, has remained well for thirteen years. In a 60-year-old man a laryngectomy for sarcoma resulted in death.

Only two of our cases were glandular carcinomata, and both cases required an extensively radical operation. One of these patients lived four and a half years, and then died of

recurrence. The second case remains cured. We have seen two cases of carcinoma of the epiglottis. Prof. Fränkel removed the tumor in the first case, per vias naturales, and I removed the carcinomatous lymph nodes of the right side of the neck. The woman has remained cured for five years. The second case was a medullary carcinoma of the epiglottis and root of the tongue. A radical operation was performed, after a subhyoid pharyngotomy, and a large lymph node metastasis on the right side of the neck was removed. The patient now lives without her canula, swallows and talks as a healthy mortal should (five years have elapsed, and she is fifty-nine years old). All the other cases were extensively carcinomata, with nothing particularly interesting to note. Concerning their histology, we have already mentioned the cases of two carcinomata occurring in two different organs of the same individual.

In five cases we extirpated the vocal cords, after doing a preliminary laryngofissure, with excellent permanent results (cured for one and one-half, two and one-half, three and one-half and four years).

In other cases we did hemi or total laryngectomy, with or without extirpation of the pharynx. We performed thirty-five hemi-laryngectomies, three of which cases ended fatally; one within twenty-four hours, of heart shock, one independent of the operation (he developed a septic phlegmon of the gluteal region), and the third case died of pneumonia after five days had elapsed.

In one series of twenty-two cases we had only one death, and that was the result of iodoform intoxication, eleven days after the operation, on a 70-year-old man. Of twenty-seven cases of transverse resection and extirpation of the larynx and pharynx, combined with lmyph node and vessel extirpation, we had one death from secondary hemorrhage from the carotid. In one case we had a hemiplegia, after ligation of the carotid. The patient became unconscious, and died in five days. One can gain an idea of what excellent advances have been made from the fact that in our first series of nine cases we lost four, and that in our first ten cases (up to 1889) we recorded only two cures.

What we have said concerning carcinoma of the stomach holds good, even to a more marked degree, for the region of the neck. The operator prolongs life and renews hope, and if, after one and one-half years, recurrence develops, even then the operation has been decidedly worth while, according to

our experience. For, in the meantime, the patient feels himself to be well and goes on living happily until the recurrence ushers in death.

We believe that statistics are of value only when cases are radically operated upon after having been diagnosed early. I can demonstrate more than thirty of my cases that are alive from one to thirteen years after operation. Of those that died, some lived eleven, eight, six and one-half, five and one-half, four and one-half and three and one-half years after operation, enjoying good health; and some of these died, not of recurrence, but of some intercurrent disease.

In one case there developed, eight years after hemi-laryngectomy, a carcinoma of the other half of the larynx, with lymph node metastases. Another operation was performed, after which the patient lived two years, dying at the age of 76. The operation prolonged his life eleven years.

Another 76-year-old man survived a pharynx and larynx extirpation for a year and a half. I have operated for tuberculosis on both sides of the larynx, and for cheesy necrosis of thyroid cartilage on one side of the larynx (twice). In these cases I resected with good results and secured healing without the use of the canula. Twice I did a total laryngectomy; and in one case, despite the operation, the patient died of cachexia. The other patient is well now, four years after operation.

In three cases I have done exentration of the larynx, excision of the epiglottis, and laryngoplasty with permanent laryngofissure. One of these cases has remained cured for seven years.

Four cases of diffuse papillomatous tumors in children were cured permanently by laryngofissure, without the use of the canula. Their speech is excellent. Transverse resection of the trachea, with subsequent suture, I have done eight times (for scars, after diphtheria or typhoid). Seven cases are healed; one died suddenly twenty-four hours after the operation. In one case we had an unfavorable functional result. I performed the plastic operation (using a skin, bone, periosteum flap from the sternum) three times, with excellent results. A demonstration of my pathologo-anatomic specimens will show that they appear to be as neatly and cleanly dissected as if they were dissecting-room specimens. Some specimens show larynx, pharynx, lymph node, cervical vessels, muscles, and part of the thyroid, all dissected out "en bloc." It is almost

difficult to conceive that the former possessor of these organs can still live and be healthy.

In the case of a 42-year-old man, who suffered from carcinoma of the larynx, I removed the larynx, six tracheal rings, pharynx, esophagus, a bunch of lymph nodes, and a struma. The tracheal stump had to be drawn out of the anterior mediastinum, and the esophagus stump was fixed with silk sutures. After his wound healed he received a prosthesis for his pharynx and esophagus. Myxedema, severe nephritis and retinitis and tetany disappeared under the administration of thyroid tablets. He was operated upon one and a half years ago, and at present looks and feels well, and attends to business. We must not regard such a case as a curiosity, and feel "better dead than thus," for this man is an important element in the support of his family.

After extensive operations on the larynx and pharynx the question of nourishing the patient is an extremely important one. We introduce a stomach tube, through the nose, or through the wound, and we begin to feed one hour after the operation. We feed every hour, day and night, with from two to five ounces of wine, bouillon, egg, somatose, thick soups, and scraped meat. We give the food cool, instead of hot, to avoid starting up vomiting. We have found a combination of cocain, hydrochloric acid and pepsin to be excellent in checking vomiting. In order to avoid heart failure and bronchitis, we are careful to regulate the temperature of the room, and to have the patient inhale oxygen, and to practise deep inhalations of pure air. Thus we get a sort of lung gymnastic, which tends to prevent bronchitis. Strophanthus, valerian and camphor we use for the pulse, when it is indicated.

Stoerk noted, in his anatomical studies, that in some of the operations certain depressor nerves which run an abnormal course are cut. Their antagonists, the accelerator nerves, then come prominently into evidence.

Grossman says that every fatal result is due to irritation of the superior laryngeal nerve, an irritation that finally travels up and affects the vagus. Whether this theory be true or not, we do know that it is a fact that in a certain number of cases heart failure and death follow a laryngectomy within forty-eight hours after the operation. I myself have lived through such a case, where the operation was not very extensive, and where the autopsy revealed no marked change in the heart itself. On this account I operate very carefully, avoiding all

unnecessary laceration, turning of the larynx on its axis, and irritations of the nerves, both during the operation and afterwards, in the course of the after treatment.

Smith makes interesting teleologic observations concerning the question whether the course of the recurrent laryngeal nerve is not of physiologic import. Davis explains the peculiar course of the recurrent, on the basis that a relationship exists between phrenic and recurrent. The phrenic is a long nerve, supplying the diaphragm; the recurrent nerve regulates the glottis. These two structures must work in harmony, and therefore the recurrent nerve is made long, so that the impulse reaches glottis and diaphragm at the same time. Elias says that the effect on the heart, after section of the vagus, is due to trophic influences, if infection has first been ruled out. Dogiel says that heart failure, after vagotomy, is due to heart exhaustion.

During the course of after treatment careful cleansing of the mouth and teeth and the administration of enemata and cathartics is very important. Before the operation the teeth should be cleaned by the dentist.

Most of the patients get out of bed, for an hour at a time, on the day of the operation. After three or four weeks they are allowed to go out for a walk. The wound heals externally in eight to ten days, in simple thyrotomy, without tracheotomy; but the endolaryngeal wound takes somewhat longer. Where tracheotomy, with tamponade of the larynx, has been done, wound healing requires twelve to eighteen days. In hemilaryngectomy, with or without laryngoplasty, the after treatment lasts fourteen to twenty-one days. Attempts to phonate are not permitted before the third week. Simple uncomplicated laryngectomy heals by primary union, in from fourteen to sixteen days. In many cases, however, complete after treatment lasts from four to five weeks.

We begin anywhere from the fourteenth to twentieth day, to have the patient attempt to swallow particles of food.

In cases where we have resected the vessels of the neck, and extirpated lymph node metastases, the after treatment naturally lasts longer, and may require eight weeks. In many of these cases we get excellent primary union.

Sometimes it is advisable to operate in two stages. If the larynx, pharynx and esophagus have been resected as far down as the mediastinum, and the patient runs no temperature, we need not change the bandage for six or eight days. The canula,

however, has to be changed. As soon as we have removed the tampon and sutures we must dress the wound once or twice daily.

Not until the fourteenth to twentieth, and often not until the thirtieth day, is the pharyngeal opening contracted enough to permit of removal of the stomach tube and the insertion of my rubber prosthesis, to supply the pharyngeal and esophageal defect. The prosthesis consists of a stomach tube, with a rubber funnel on one end. The tube is put into the esophagus and pulled down until the funnel rests behind the base of the tongue. The whole thing is held in place by a silk thread. The patient can swallow perfectly with this apparatus, and can even speak through it in a loud whisper. If the tube does not become stopped up, or the pharyngeal opening does not become too large, it can remain in place six weeks, after which time it is changed. If the pharyngeal wound dilates, then the prosthesis must be removed and left out for a few days, after which it is put back in place again. If the wound cicatrizes around the prosthesis, then it is possible that the prosthesis must be permanently removed.

One of my patients, on whom I did a radical operation in June, 1903, has worn my prosthesis without changing it once in seven months. He eats well, speaks excellently, and has gained sixty pounds.

Some cases, those in particular in whom the epiglottis has not been removed, are subject to inflammation of the epiglottis, because of the irritation of the rubber. In these cases we change the prosthesis frequently and leave it out for a few days. This raises the question whether it is not better in all cases to remove the epiglottis. Some cases, however, bear the prosthesis well, despite the fact that they still have their epiglottis.

In cases where the base of the tongue was resected, and where a single vertical incision was insufficient, there remains quite a defect, limited above by the stump of the tongue, and below by the tracheal and esophageal stump. This defect must be closed in stages by the use of various skin-flaps.

Regarding the type of speech after these operations I may say that, after extirpation of the epiglottis, exentration of the larynx, and total laryngoplastic, with consecutive laryngoschism, the patients learn to speak very well. They also speak well after resection of a vocal cord and the surrounding tissue, for circumscribed carcinoma. A cylindrical scar takes the

place of the lost cord and functionates in common with the healthy cord. The resulting voice is not melodious, but is strong and loud. The voice is about the same as the above-described, after hemilaryngectomy, especially if a laryngoplasty has been done according to the method I have described.

In laryngectomy, done according to the Billroth-Czerny method, only a few patients retain the voice-producing structures, and most of them can speak only in a whisper.

It is of particular interest, as Hans Schmidt has pointed out, that patients, robbed of an organ as important as is the larynx, can nevertheless, by practice and instinctive accommodation, learn to speak so well, despite the fact that there is no communication between the air-containing lung and the buccal or pharyngeal cavity.

The larynx may be considered as a double-tongued membranous pipe; voice is produced by the vibrations of elastic membranes. Voice, naturally, has its origin in the larynx only as long as the individual possesses that organ. If the organ is destroyed through obliterating scars, or through extirpation, then we are obliged to construct an artificial larynx, such as the ingenious one of Czerny-Gussentauer, made of a rubber or metal tongue, which is set in vibration by the stream of expired air, and produces tones deep in the pharyngeal, buccal and nasal cavities.

J. Wolff has attempted to produce tones by the use of a rubber tongue, obliquely introduced, regulated by a screw, and protected from buccal mucus by a sieve.

The artificial larynx strains the lung; it causes disturbance and irritation in swallowing, and therefore predisposes to recurrence in the neighboring tissue. Very often we can dispense with all artificial phonating apparatus, particularly since we know that parallel bars of tissue, which look like the vocal cords, and are situated where the cords originally were, can be set in vibration and produce sounds. Two scars, or two folds of mucous membrane, may, under circumstances, produce a spurious glottis, even in the pharynx. In one case a patient without a larynx spoke so distinctly that one could hear him sixty feet removed. This he did by means of the constrictor muscles of his pharynx.

In addition to the "chest" voice and the "fistula" voice, we have the whispered voice, "vox clandestina," which is not characterized by regular vibrations of air, as is the normal voice. The whispered voice is merely a sort of a murmur, and

is produced by the rubbing of irregular blasts of air against the somewhat thickened (instead of the fine membranous) edge of the cords. During whispered voice the glottis is moderately narrow.

When our well known colleague, Hans Schmidt, now dead, showed a case of total laryngectomy (1888), who possessed spontaneous speech, despite the fact that there was no communication between his pharnyx and trachea, he excited general wonderment. Prof. B. Frankel explained the phenomenon on the ground that the patient swallowed air into his esophagus, and then set this air in motion with the pharyngeal muscles. Folds in the pharyngeal mucous membrane served as a cord that vibrated under the impulse of the expelled air.

Glassblowers and goldworkers also take in as much air as their mouth will hold, and then use the air for their work. In a similar fashion laryngectomy patients can fill their pharynx and esophagus with air, to be used in producing tones, by expelling it against the ridges and folds in the pharyngeal and esophageal mucous membrane.

This whole question has aroused a great deal of interest, since a great number of surgeons have adopted, with good result, my suggestion (and Zeller's, 1881) to resect the trachea, preliminary to laryngectomy, as a prophylactic measure against foreign body pneumonia. The suture of the tracheal stump in the lower angle of the wound permanently closes off the trachea from the secretions of the buccal and pharyngeal cavities.

If Frankel's explanation of Schmidt's case was correct, then, I argued, if I put one end of a tube in the nasophoryngeal space as far back as the tip of the uvula and inserted the other end, air-tight, in the tracheal stump, the patient could inspire through the nose and mouth, and could then expire in such a way as to produce tones in the pharynx, which would be distinctly louder than the whispered voice.

For patients in whom I have performed total laryngectomy, with subsequent plastic operation on the esophagus, I have constructed the following apparatus, in order to intensify their voice: A small rubber prosthesis, fitted with a valve, fits air-tight in the trachea. The valve opens with inspiration and closes with expiration. The expired air is conducted into a rubber tube, distal to the valve, and this tube is connected with a phonation contrivance shaped like an olive. The olive continues as a rubber tube, and this rubber tube the patient inserts through his nostril as far back as the uvula. The olive

remains in the nostril. By blowing through this olive the patient can speak loud and plainly. The difficulty with this apparatus is that the tones set the skull bones vibrating to such a degree that they interfere with the patient's hearing, as well as with his sight and articulation.

In order to secure co-ordinate action between phonation and articulation we must lengthen the tube of the phonation contrivance. If the lungs act as a balloon and expel air into the apparatus, then we get phonation and articulation depending upon one and the same impulse. Through the kindness of our colleague, Th. S. Flatau, we have had phonographic records taken, which show a good result. Other authors, Stoerk, Hohenegg and Pean, have made attempts similar to ours, only they used air bags. What I am discussing here is the principle of creating artificial voice where there is no communication between the air passages and the naso-pharyngeal space, a principle which both physician and patient is called upon to develop. The apparatus that I have described is manufactured by the instrument maker Windler, of Berlin.

The simplest instrument is very often the best. Thus we get an excellent voice merely from leading a rubber tube from the trachea, through the nose, into the naso-pharynx. The patient can breathe comfortably through this tube, and with the expired air he can produce tones. A fundamental necessity is that the tube should go through the nose as far back as the uvula. The following mechanism, *e. g.*, can be constructed: Put one end of a rubber tube in the patient's nostril and the other end in the tracheal canula, by means of an air-tight joint. The respiration takes place through the mouth, or through the other nostril. The expired air produces tones in the pharynx, which result is a moderately loud whispered voice. This voice is sufficient for all purposes; if, however, the patient desires a louder voice, we can create it in the following simple manner: Somewhere along the course of the tube we switch in a phonation apparatus. This apparatus is set into vibration, and tones are produced by the expired air, and these tones are emitted as speech from the various organs in which the tube may end—mouth, nose, or lips. If the tube ends just in front of the lips, then we get a fairly loud voice, which is produced in a manner just the reverse of normal voice production, viz.: articulation occurs before phonation. I must admit that most of my patients do not care to use any phonation apparatus, being satisfied with the tones they produce with their unaided pharynx.

There are a certain number of cases who do not instinctively learn how to use their voice, and these cases Dr. Gutzmann teaches how to talk by having them practise certain exercises. He gets very good results. In all these cases the respiratory tract is entirely out of connection with the speech organs, and the patients are not burdered by having to carry any prosthetic apparatus. We avoid the hissing of air alongside the tracheal canula by taking taking a cast of the tracheal opening, and then having a prosthesis made, which fits in it and hugs the canula closely, so that it fits in the trachea air-tight.

We have collars, ties and rubber bibs made so cleverly that the patients who wear them appear as a normal, healthy person ought to appear. We have devoted a good deal of attention to this phase of the question, because some patients are extremely sensitive about their fellowmen discovering their scarred-up condition. By our present operative methods we avoid tracheal fistula with almost certainty. If one does occur, now and then, we close it, either by a plastic operation, or by a prosthesis. I shall not describe the various rubber rings and contrivances made to fit over the canula, for my method of taking a cast and then fitting a prosthesis air-tight over the tracheal opening answers all purposes. Claude Martin has described an artificial larynx, made according to the size and shape of the removed larynx. I shall merely refer to his original article in the "Monatschrift für Zahnheilkunde," September, 1902. I personally have never felt the need of the apparatus. It might be of use in those cases where, after extensively radical operations, large defects remain that we cannot repair by plastic work.

I never modify my plan of operation with the end in view of adapting a good prosthesis. First and foremost I am concerned with saving the patient's life. Cosmetic effects are of secondary importance. It may be that in the future the instrument maker and the surgeon will reach a compromise, for art is long and life is short.

My particular interest in laryngeal operations dates from 1879 to 1881, when, as assistant of v. Langenbeck, I published a paper on "Phophylactic resection of the trachea," together with Prof. Albert Zeller. The purpose of this paper was to show how, by a preliminary operation, we could avoid many of the dangers of pharynx and larynx operations. We advised transverse resection of the trachea and implantation of the lower end in a transversely made skin wound. Our conclusion was: "In

extirpation of the larynx, or, in fact, in all operations, after which a foreign body pneumonia so frequently leads to death, a prophylactic resection of the trachea offers a certain guarantee against the occurrence of an aspiration pneumonia. If we are careful, both during the operation and after treatment, to guard against an aspiration into the air passages, we are still liable to the danger of septic mediastinitis and secondary hemorrhage. I have already considered the best means of avoiding these complications."

W. Lublinski (Observations on the remarks of Sir Felix Semon, on the radical operation for laryngeal new growths) states that up to the year 1881, 52.6 per cent. of patients died during the operation, or during the after treatment. From '81 to '91 the mortality fell to 46 per cent. The mortality has gradually fallen, partly as a result of my method of operating, until it has reached 18 per cent. Von. Bergman, Kocher, Mikulicz, and their pupils publish cases with a mortality of 8 to 11 per cent. I myself published a series of cases where the mortality was 4.5 per cent. Semon, Butlin, Chiari, Fränkel and Jurasz have published excellent results following thyrotomy and endolaryngeal operations. In considering plastic work done on the pharynx and esophagus we must give the first place to v. Hacker and v. Hochenegg. Foederel, Küster, v. Bruns and Enderlen have also gotten beautiful results in plastic work on the trachea. Of course we must consider the fact that statistics are very often deceptive. Yet we can honestly say that a laryngectomy which in 1881 was followed by a mortality in 52.6 per cent. may now be done with as great a degree of safety as an interval appendectomy.

For a certain group of tumors of the pharynx and base of the tongue, where we fear an aspiration pneumonia, and where, for example, a subhyoid pharyngotomy is necessary, we think it advisable, after first making a low tracheotomy, to pack off the aditus of the larynx with gauze, or to sew the epiglottis or a skin-flap over the larynx.

In smaller operations, even after a subhyoid pharyngotomy, we can avoid performing a tracheotomy in the manner that has been described by so many authors. However, this matter does not interest us here, where we are merely dealing with the question of avoiding aspiration pneumonia.

Barring accidents and constitutional anomalies, laryngectomy, performed according to my method, may be counted as an operation relatively free from danger. The radical opera-

tion, indeed, seems to be safer than the so-called atypical partial operations; for these latter operations we as yet have no definite technique.

Early diagnosis and radical operation are the two important things on which the fate of the patient depends. In both these directions we have made enormous advances. By our modern methods we can and must rule out tuberculosis, syphilis, scleroma, and scars due to various other diseases.

My work on resection, mobilization and suture of the trachea, as well as my work on laryngo—esophago—and pharyngoplastic, has won fundamental significance. It has been extended and modified. In the first place, we have succeeded absolutely in avoiding aspiration pneumonia, and thereby have been able to exclude one of the most frequent causes of death.

It is of particular significance to me to be able to determine that as a result of my work on resection of rather extensive portions of the trachea, we are able to secure excellent functional results. We have considered it our duty to those patients who get a recurrence to lessen their pain by means of morphine, and to do what we can for them by means of the X ray, arsenic, etc. We see often enough that patients live a surprisingly long while after the onset of a recurrence; that part of the tumor undergoes regressive changes; that an abscess cavity cleans up and heals, and that erysipelas disappears. I have also repeatedly used cancroin; it never has done any harm, and in some cases the tumor growth came to a standstill, just as we sometimes see in carcinomata. The matrix of the tumor remains, however, and unfortunately recurrence may occur at any time. Work along these lines, and the erection of cancer hospitals, like von Leyden's institute, is a blessing to humanity. He who will discover the etiology of successful treatment of tumors, with a serum or other internal medication, will earn for himself a monument from all humanity. Until we progress that far, however, the cure of carcinomata is left to the knife of the surgeon. Of course, we all hope for the time when the surgeon's bloody work will be merely a matter of past history.

In 1854 Bernard v. Langenbeck first conceived the idea of laryngectomy for malignant growths of the larynx, and tried the operation in his Berlin clinic; since then a half century has elapsed. Twenty-five years ago he spoke as follows before the German surgical congress, concerning extirpation of the pharynx: "Gentlemen—It may seem bold of me to direct your attention to an operation with which, up to the present, I have

had only bad results. But exactly on this account I speak of it, because I think our combined efforts will serve to introduce into surgical practice an operation whose performance is surely safe, even if its results are dangerous."

As late as 1900 so great a master as Kronlein reported that in growths of the hypo-pharynx, all operative methods for recovery are very small. He operated on eight cases, and six of these eight died, four from pneumonia, one from exhaustion, and one from hemorrhage. Possibly his results have been better since then.

In 1903 I reported twenty-seven cases of pharynx resection, done in the course of laryngectomies (Swansea annual meeting, British Medical Association), with only two deaths. One case died as a result of ligature of the carotid, developing hemiplegia and unconsciousness, which led to death in five days. The other case died of hemorrhage from the carotid.

Since then, up to April 7, 1904, I have done seven other operations, three cases of extirpation of larynx, pharynx and esophagus, two cases of extirpation of the larynx and pharynx, with resection of the tongue. These five patients were discharged cured. The sixth patient, in whom I had to resect a large lymph node metastasis, and who had phthisis, died two months after operation from erysipelas migrans. The seventh case was a 69 year-old man, who died three days after operation.

Thus I lost four cases in a series of thirty-four, and three of these four cases died of accidental causes, not attributable to any faulty operative technique. The fourth case died of bronchitis.

Thus Langenbeck's hope has come true, and we have discovered the secret on which depends successful results in pharyngectomies. Moreover, the method of operation should be characterized as an absolutely new and original one. Laryngectomy and pharyngectomy, done for malignant growths, have become fairly safe operations, and the postoperative result is a satisfactory one.

We doctors, who follow earthly sorrow with open eyes and sympathetic heart, when we can no longer cure must console the patient and provide for euthanasia.

If, however, we can do things by means of surgery, which only yesterday were impossible, then we should never lose sight of the task that our function is to prolong life.

Many patients are preserved for their family, and enabled

to follow their pursuits in life, despite deforming operations; they are grateful for what medicine has done for them, and they agree with the truly philosophical words of resignation of the poet, Hieronymous Lorm:

"Though all my life surrounded be,
By inky night and trouble,
One single ray of sunshine still,
My heart's ease serves to double."

XXXIII.

INFERIOR ETHMOIDAL TURBINATE BONE.*

By Howard A. Lothrop, M. D.,

of Boston, Mass.,

Assistant Visiting Surgeon, Boston City Hospital; Instructor in Surgery, Harvard Medical School.

Method of Investigation.—The results presented below are based upon a study of about 1,000 specimens obtained in the dissecting-room and the Warren Museum of the Harvard Medical School. Most of the specimens represent dissecting-room material intact and in a good state of preservation, and the balance consists of about seventy skulls in which the bony outer wall of the nasal fossa was not broken. Some of the specimens were studied before and after maceration. In no instance was the clinical nasal history known. I am indebted to Professor Thomas Dwight for the opportunity to carry on this investigation. I owe much to Percy Emerson Brown, M. D., for his skill in obtaining photographs of the specimens.

Nasal Fossa.—The nasal fossæ are two more or less symmetrical cavities placed side by side and separated from each other by the septum of the nose, which forms the internal wall in either instance (Figs. 30, 32, and 35). The fossa is open in front and behind at the anterior and posterior nares and is bounded above and below and laterally by four walls. The floor is much wider than the roof and the lateral walls are the most extensive. The nasal fossæ are surrounded by four other fossæ—above is the cranial fossa; laterally, the orbital fossæ; and below, the cavity of the mouth (Fig. 33).

The floor of the nasal fossæ will not be considered. Certain features of the roof and internal wall which bear important relations to the inferior ethmoidal turbinate will be referred to. The outer wall is not only the most intricate, but also is of the greatest surgical importance. This outer wall is bounded chiefly by the internal surface of the body of the superior maxilla and its nasal process, and by the internal surface of

*Lothrop, "Frontal Sinus and Anterior Ethmoid Cells," Annals of Surgery, 1898.

the lateral mass of the ethmoid bone, but, in addition, this wall is completed by the nasal, lachrymal, and inferior turbinate bones, and internal pterygoid plate of the sphenoid bone (Figs. 1-10). The most striking feature of this wall is its irregularity made by two large bony projections called the inferior turbinate bone and the inferior ethmoidal turbinate ("middle turbinate"). There are always one or more lesser projections which are called superior turbinate bodies, but these are of little clinical importance.

The ethmoid bone is usually described as presenting a median vertical plate (lamina perpendicularis) which forms part of the nasal septum, and across the top of this is a horizontal, perforated plate (lamina cribrosa) which separates the nasal and cranial fossæ. On either side of the lamina perpendicularis, suspended from the lamina cribrosa, is a cuboidal, cellular mass of bone called the "lateral mass." The outer wall of the lateral mass is bounded by a flat plate of bone, called the os planum, forming part of the inner wall of the orbit. The inner wall of this lateral mass is very irregular and forms a part of the outer wall of the nasal fossa. The irregular bony cells between these two walls constitute the greater portion of the anterior and posterior ethmoidal cells (Figs. 30, 32, 35, and 36). All the ethmoidal turbinate bodies or bones are projections from this internal wall (Figs. 8, 9, 41, and 44). The lower projection is called the inferior ethmoidal turbinate ("middle turbinate"), and is the structure under particular consideration in the following pages.

Internal Wall of the Lateral Mass (Figs. 1-25, 40-47).—The internal wall of the lateral mass is a more or less quadrangular area of bone, which serves both as an internal boundary for many of the ethmoid cells and likewise as a portion of the external wall of the nasal fossa. It consists entirely of a portion of the ethmoid bone. The upper border corresponds to the line of junction of this surface and the lamina cribrosa and is carried forward anteriorly on to the inner surface of the nasal process of the superior maxilla, and posteriorly to the ethmoid spine of the sphenoid bone. It is slightly convex towards the septum corresponding to the narrow portion of the roof of the nasal fossa (one to five millimetres). The inferior border is free and corresponds to the inferior border of the inferior ethmoidal turbinate (to be described later) and the anterior border of this surface corresponds to the anterior border of this turbinate. The posterior border is vertical and is the

line of junction between this surface and the anterior surface of the body of the sphenoid bone. It forms a vertical groove and is called the spheno-ethmoidal recess (Figs. 4 and 12).

The surface, as a whole, is rough, and its most striking feature is the presence of an oblique deep groove which, if continued, divides it into two triangles. The groove is known as the inferior ethmoidal fissure (all lateral views). The lower triangle is the inferior ethmoidal turbinate ("middle turbinate" of the nose). The upper triangle may present an intact surface, but is frequently subdivided by a fissure known as the superior ethmoidal fissure (Figs. 25 and 43) and rarely by another fissure (fissura suprema) (Fig. 9). According to the presence of these fissures there will be a variation in the number of superior ethmoidal turbinate bodies. This upper triangle forms the proper internal wall of most of the posterior ethmoidal cells. Its surface is somewhat convex towards the nasal septum, and posteriorly it looks backward towards the sphenoid bone. The surface is rough in consequence of numerous small vertical grooves and foramina for branches of the olfactory nerves (Figs. 5 and 11).

Inferior Ethmoidal Fissure (Lateral views).—The inferior ethmoidal fissure is always present and runs obliquely downward and backward across the posterior half of this surface of the lateral mass. The anterior extremity starts just below the centre of the surface, about fifteen to twenty centimetres from the anterior border, and intersects the posterior border. Below, it forms the posterior part of the upper boundary of the inferior ethmoidal turbinate, and its upper border is made by the free edge of the next ethmoidal turbinate ("superior turbinate"). Its posterior extremity is open and ceases near the sphenopalatine foramen, but it is closed in front. Usually two or three posterior ethmoidal cells open into it by means of ostia which are apt to be larger than ostia of anterior cells. The floor of the fissure is made by the horizontal position of the inferior ethmoidal turbinate (Figs. 31 and 35) and looks upward and backward. It is comparatively broad and may extend to the os planum (Fig. 31). Pus from these cells is usually directed towards the pharynx. The fissure ends abruptly, but in certain cases it is prolonged as a shallow groove for a variable distance on the internal surface of the inferior ethmoidal turbinate (Figs. 15, 19, and 22), or may be carried forward into the turbinate body itself and there dilated into a cell, as will be described later (Figs. 3, 23, 45-47).

The average inferior ethmoidal fissure measures twenty-six millimetres in length and about six millimetres in width.

Superior Ethmoidal Fissure (Figs. 9, 14, 25, 40-44).—This fissure is absent in at least sixty per cent. of the cases. When present, it has the same general direction as the inferior ethmoidal fissure. It is about half as long and is situated a short distance above it. It is a groove, deeper in the centre, and it terminates posteriorily in the spheno-ethmoidal recess. It is exceptional for it to possess the ostium of more than one posterior ethmoidal cell. In very rare instances there may be still another groove above this known as the "supreme ethmoidal fissure."

When only the inferior fissure is present, there are two ethmoidal turbinate bodies; the presence of the superior fissure adds a third body. Hence, counting the inferior turbinate bone, there are three turbinate bones, so called, in about sixty per cent. of the cases, and the presence of four such bodies is not unusual, but a fifth is very rare. Only the inferior turbinate bone and the inferior ethmoidal turbinate ("middle turbinate") have any real practical importance. The spheno-ethmoidal recess is a vertical groove just in front of the anterior surface of the body of the sphenoid bone where the ethmoidal fissures terminate behind, and into which opens the sphenoidal sinus.

Ethmoid Cells (Figs. 30, 32, 33, 35, 36, 39, and 47).—The ethmoid cells will be considered only in a general way. They are most conveniently divided into two groups—the anterior and posterior cells. They are contained in whole or in part in some portion of the lateral mass of the ethmoid bone and completed by portions of facial bones, which need not be considered here. All cells whose ostia open below the inferior ethmoidal turbinate are called anterior cells, those which open above are called posterior cells. In a general way, the anterior cells are in front of the posterior cells, although they may overlap extensively. The division into a middle group situated opposite the os planum does not appeal to the writer.

The anterior cells have been described in a previous work * with considerable detail, and were summarized as follows:

A series of cells whose ostia are situated along two ethmoidal fissures (homologues), viz.: along the hiatus semilunaris, and the fissure between the bulla ethmoidalis and the inferior ethmoidal turbinate. There are three groups of cells:

(*a*) A group represented by the bulla ethmoidalis and its subdivisions.

*Republished by courtesy of the Annals of Surgery. No. 2.

(*b*) A group of cells crowding into the posterior angle of the frontal sinus which drain into the infundibulum, the turbinate fossa, and the upper part of the fissure above the bulla.

(*c*) A group of cells opposite the lachrymal bone which drain into the infundibulum.

The Posterior Ethmoid Cells.—In general, these cells are situated behind the anterior cells. They are bounded internally by the internal wall of the lateral mass (Figs. 30 and 35), in the ethmoidal fissures of which are situated their ostia. Posteriorly these cells are in close contact with the sphenoidal sinus and may run back external to it. The sinus, however, always has its own ostium, which opens into the spheno-ethmoidal recess. Externally these cells are limited chiefly by the internal wall of the orbital fossa (Fig. 33). Above they enter a varying distance between the two laminæ of the horizontal portion of the orbital plate of the frontal bone (Figs. 2 and 14). They are larger and less numerous than the anterior cells and usually number from four to seven. There is a cell in front of the sphenoidal sinus, opposite the superior turbinate, which is generally the largest, and it may equal this sinus in size. The ostia of these cells are few. There may be one to three in the inferior ethmoidal fissure, and one in the superior fissure if this fissure happens to be present. These cells almost never open into the spheno-ethmoidal recess. The superior turbinate body may consist simply of a ridge of bone on the wall of a large cell, (Figs. 31 and 39.) There is sometimes a prominence made by this cell called the "tuberculum ethmoidale posticum" (Fig. 43, No. 4). A posterior cell may communicate with the cell of the inferior ethmoidal turbinate (Figs. 45, 46, and 47). The total capacity of the posterior cells is usually less than that of the anterior, although, individually, they may be larger. Their ostia are so large and their drainage so good that they are less liable to be the seat of suppurative disease. The ethmoidal cells are absent at birth (Fig. 26), but develop slowly, and are not completely formed before the age of twenty years.

The Inferior Ethmoidal Turbinate (all lateral views).—The inferior ethmoidal turbinate bone is the anteroinferior triangle marked off on the internal wall of the lateral mass of the ethmoid by the inferior ethmoidal fissure and a line projected forward and upward to the anterosuperior angle of the surface. The lower part of the turbinate hangs more or less ver-

tically as a free lamella of bone (Figs. 30 and 32). It is commonly called the "middle turbinate bone," but it is a part of the ethmoid bone, and is more accurately termed the inferior ethmoidal turbinate.

The general shape of this lamella of bone is triangular, and it presents for descriptive purposes two surfaces, internal and external; three borders, superior, anterior, and inferior, and three angles, posterior, superior, and anterior.

Internal Surface.—The bony surface is rough, but when covered with mucous membrane it is comparatively smooth. It is triangular and narrow posteriorly, and presents a varying degree of convexity towards the septum. The anterior and upper portion is rather flat, but inferiorly this lamella of bone curves sharply outward. At the inferior ethmoidal fissure this surface turns a sharp angle so as to form the floor of the fissure, and here it faces upward and backward (Figs. 31 and 35). Its length depends upon that of the fissure, and its breadth is commonly that of the lateral mass. It may be separated from the orbital fossa by the inner wall of the latter, or some posterior ethmoid cells may intervene. It may be twelve to thirty millimetres long and ten millimetres wide. This surface directs the pus from these cells into the pharynx. Towards the lower part of the internal surface are grooves for branches of the sphenopalatine artery.

The surface, as a whole, is rather smooth, but occasionally presents well-marked horizontal grooves, which are in the centre of the surface, and do not extend into the ethmoidal fissure (Figs. 9, 18, 19, 22, 26, 40-44). If very deep they form a well-marked gutter, and if broad, they tend to reduce the normal convexity of the surface. The anterior extremity occasionally terminates in a pocket, but never in a distinct cell. In only one instance has there appeared a "middle turbinate" which presented a true internal concavity rather than a convexity (Fig. 34). Unlike the external surface, there are no cells on it. It is unusual for a groove to measure more than twenty millimetres long by three millimetres deep and three millimetres wide. They are rarely multiple. The lips of a prominent groove can be observed from the anterior nares and the region explored with a probe.

Occasionally the internal surface may present one or two elevations. The lamella at the agger nasi may be unusually elevated so as to make a prominence called the "tuberculum nasoturbinale," which is simply a well-marked agger nasi

(Figs. 5 and 8). When the superior and inferior ethmoidal turbinates meet at the beginning of the inferior ethmoidal fissure there may be a prominence made by an ethmoid cell; this is called the "tuberculum ethmoidale posticum" (Fig. 44, No. 5). The "tuberculum ethmoidale anticum" has been noted in connection with the superior turbinate (Fig. 43, No. 4).

Internal to the turbinate is the septum nasi, with which it should not be in contact. Usually there is a space of two to five millimetres between them called the olfactory fissure (Figs. 30 and 38). They may be in contact as a result of a malposition of the turbinate or because it contains a large cell, or there may be a deviation of the septum or a cartilaginous or bony spur. It is a clinical observation that the development of the turbinate depends upon the amount of space necessary to fill. For example, if the septum is crowded to one side so as to touch the turbinate, this body is apt to recede, and the two surfaces do not remain in contact. Meanwhile, the concavity on the opposite side of the septum is more or less filled by a compensatory hypertrophy of the opposite turbinate. Most of the increase is due to a hyperæmic condition of the turbinal covering. Opposite the greater part of the inferior ethmoidal turbinate is the lamina perpendicularis of the ethmoid. If the turbinate is large, it may be opposite the triangular cartilage; but the posterior extremity is always opposite the upper part of the vomer. As a result of trauma, the opposing surfaces may become adherent by bands varying in extent, particularly if both surfaces are wounded.

External Surface (Figs. 30, 32, 37, 38, and 39).—The external surface faces outward and presents in general a concavity most marked in the lower horizontal half. This is called the sinus of the turbinate (sinus turbinalis). Towards the superior angle the surface is flat, and near the posterior angle the upper portion of the surface looks downward and forward. This surface is rougher than the internal surface, and commonly presents depressions or pockets and orifices leading to cells which will be considered later.

The external relations of this surface are very important and complicated. Opposite the upper angle is a space which varies in size, and it has been termed the turbinate fossa. In fifty per cent. of all cases the frontal sinus opens here without communicating with the infundibulum (Figs. 30 and 32). Some of the ostia of anterior ethmoid cells are found here. Opposite the turbinate sinus are the bulla ethmoidalis, hiatus

semilunaris, and processus uncinatus. The outline of the bulla frequently corresponds to the concavity of the sinus, but the bulla may be flat, consisting of a simple lamina of bone, may be generally enlarged and symmetrical, or may be drawn out into a nipple like process (Figs. 37, 38 and 39). Hence, its proximity to the turbinate will vary. The general direction of the uncinate process conforms roughly to that of the free borders of the turbinate, but at the extreme upper limit of the anterior border of the turbinate these two structures are usually in contact. The average bulla is about ten millimetres long, and posteriorly its surface is continuous with the under surface of the turbinate. The relation between the bulla and sinus turbinalis is fairly constant, but the former may be so large as to fit into the sinus. Occasionally a band of mucous membrane passes across from one to the other.

The turbinate may be directed outward so sharply as to come in close proximity to the structures external to it, and may occasionally come in direct contact with them. The space may be narrowed, furthermore, by an hypertrophied condition of the mucous membrane of by the presence of polypi. These conditions are of great importance, for the ostia of difference sinuses and cells may be obstructed thereby.

Superior Border.—This is the longest border, and it runs obliquely upward and forward across the internal wall of the lateral mass, dividing it into two triangles as mentioned above. It has a bony attachment throughout its extent. Beginning posteriorly at the sphenopalatine foramen, it crosses the superior turbinate crest of the palate bone, thence along the inferior ethmoidal fissure, whence it is continued in the same direction as an imaginary line to the cribriform plate, and then towards the median line to reach the internal surface of the nasal process of the superior maxilla. This is the superior angle (Fig. 4). All of the lamina below this line is treated as the inferior ethmoidal turbinate for descriptive purposes. In the disarticulated ethmoid bone, the anterior border is very obvious.

Anterior Border.—This border extends from the superior angle downward to meet the inferior border at the anterior angle. It is the shortest border. It passes downward for a variable distance on the internal surface of the nasal process of the superior maxilla, often in conjunction with the anterior extremity of the uncinate process. Thence it continues in a general downward direction as a free border, slanting forward

or backward to reach the anterior angle. This free angular portion of the turbinate is called the "operculum" (Figs. 4, 5, 6, 8, 9 and 14). The prominence of the operculum depends upon the length of the free portion of this border. It is open to inspection from the anterior nares.

Inferior Border.—The inferior border connects the anterior and posterior angles. It is generally horizontal and is free for its whole extent. It is fairly regular and follows the outward curled portion of the turbinate. This border is thickened, grooved and channelled for vessels, and towards its anterior end it contains at times dense bone tissue. The border may be deeply notched (Figs. 13 and 41, Nos. 1 and 3). The bone tissue is more dense here than elsewhere in the turbinate. A part of this border can be seen from the posterior nares (Fig. 31).

Posterior Angle.—This angle is at the junction of the superior and inferior borders and is situated just below the sphenopalatine foramen, close to the internal plate of the pterygoid process. The bony angle is flat, and, as a rule, it is not accentuated by the mucous membrane, as is the corresponding angle on the inferior turbinate bone. It is on the same level as the Eustachian tube and in the same vertical plane as the angle of the turbinate below. In contrast to the angle of the lower turbinate a sling can rarely be made to catch on the posterior angle of the inferior ethmoidal turbinate (Figs. 21 and 23).

Superior Angle.—This is placed obscurely at the junction of the superior and anterior borders near the roof of the nasal fossa just internal to the ostium frontale. Just external to it is the turbinate fossa, which may be a comparatively wide space and contain the openings of the frontal sinus, the frontal bulla, and some of the anterior ethmoidal cells. Just below it is the prominence of the agger nasi, which corresponds to a turbinate in certain of the lower mammalia (Figs. 5 and 8).

Anterior Angle.—This angle is at the junction of the anterior and inferior borders. It is the only free angle, and its prominence depends upon the length of these borders; hence, it may be more or less a right angle (compare lateral views). This portion of the turbinate acts as a sort of cover and is called the "operculum." It is open to inspection from the anterior nares. It may be thick or thin, and is much dilated by an extensive cell formation which has been termed "concha

bullosa." The operculum hangs vertically, and may be directed outward or inward.

General Structure and Variations of the Turbinate.—The bony lamella is comparatively thin, particularly at its point of greatest convexity, but along the inferior and anterior borders it is frequently very dense. Throughout the greater part of its extent it is not thicker than an egg-shell, and contains numerous perforations (Figs. 1-10). The turbinates in the aged are extremely thin and brittle. One specimen (Figs. 32 and 33) is unique, and the only example found in which the turbinate is made up of comparatively thick, dense bone.

Variations in the outline have been noted, likewise the occurrence of one specimen which presented a concavity towards the septum (Fig. 34). There is considerable uniformity in size. A relatively large turbinate is shown in Fig. 14.

The turbinate may appear to be absent, as seen in Figs. 16 and 17, but in every instance there is either a bony ridge or membranous flap to mark its presence. Ordinarily, when viewed laterally, the bulla and uncinate process cannot be seen, but not infrequently the uncinate process is exposed, and only in cases of extreme atrophy is the inferior border of the turbinate higher than the bulla (Figs. 16, 17, 43, No. 3, and 44, No. 3). The middle turbinates of opposite sides are never precisely alike, and they often present marked asymmetry (Figs. 30 and 32). The cellular structure will be considered below.

The inferior ethmoidal turbinate is covered with a thin periosteum, a small amount of loose connective tissue, outside of which is mucous membrane possessing ciliated, columnar epithelium. In the mucous membrane and the connective tissue, especially on the internal surface and lower border, are numerous cavernous spaces which can be filled with blood. The various passages can be thereby much narrowed. The condition is known as hyperæmia, and this tissue is an example of "erectile tissue." Ciliated mucous membrane lines the structures which have been considered above, including all the cells connected with the ethmoid bone.

The blood supply of the middle turbinate is derived chiefly from branches of the sphenopalatine artery, and these run forward along the inferior portion, forming an extensive anastomosis.

The sensory nerve supply is derived chiefly from branches of the superior maxillary division of the fifth pair of cranial

nerves. A few branches of the olfactory nerve are distributed in the vicinity of the superior angle, extending down a short distance on the internal surface of the turbinate.

Cells of the Inferior Ethmoidal Turbinate (Figs. 3, 20-24, 27-39, 45-47).—Ordinarily, the middle turbinate consists of a thin, curved lamella of bone which is a part of the ethmoid bone. It is thinnest opposite the sinus turbinalis, and its thickest portion is along the inferior and anterior borders in the vicinity of the inferior angle. This thickened portion may be more or less cancellated and tunnelled for vessels, and is sometimes of sufficient width as to present an inferior surface. Small exostoses sometimes occur.

As will be seen below, it is a common occurrence for this lamella of bone to contain cells of different sizes and shapes, located in different portions of the turbinate. A cell located in any portion of the turbinate can be properly called a middle turbinate cell, and all such cells will be considered below. These are strictly ethmoid cells and could be classed as anterior or posterior, as will be observed below.

There is much confusion in the literature as to the origin and nature of these cells, which I believe is due primarily to a lack of investigation of a large number of normal turbinates, and, secondly, to errors by clinicians who remove portions of cell walls which have been changed by pathological processes, and are led to believe that all such cavities are pathological. They are usually described as "osseous cysts." In anatomical works the first mention of cells of the middle turbinate was made by Santorini, and later similar observations were made by Zuckerkandl. So far as I can learn, no other very extended anatomical investigation has been made. Dupuytren appears to have made the first clinical report of middle turbinate cells.

As has been noted, the following statements and conclusions are based on the study of about one thousand middle turbinate bones, obtained from dissecting-room subjects and museum specimens. The turbinates of very few children could be obtained, but a considerable number of new-born infants were examined. By far the greater number of specimens represent the adult condition, including all ages. The sex in these cases was not followed closely, and there seemed to be no reason for believing that cells appeared more commonly in one sex than the other.

Age.—There are no ethmoid or middle turbinate cells at birth. The ethmoid cells begin to develop at about 5 years

of age, but I discovered no turbinate cell in children. They were equally common in all ages of adults. Comparing the cells of all ages, they appeared to reach their normal development synchronously with the ethmoid cells, and then remained stationary unless altered by disease or the thinning of bone in old age.

Occurrence.—Of 1,000 inferior ethmoidal turbinates, eighty-nine contained a cell, making about nine per cent. of all cases. In a previous smaller series of cases, all of which are included in the above, the percentage was eighteen, hence it was a matter of chance that the early specimens contained cells. In 6.7 per cent. only a single cell was present, in 1.3 per cent. two or rarely more cells coexisted. In ten of the 1,000 cases, or 1 per cent., both middle turbinates of the same subject contained cells. The cells were slightly more frequent in the right than in the left turbinate.

No cell was discovered in the inferior turbinate. In the superior turbinate region, the lamella of bone which constitutes this turbinate is often very thin and narrow, so that the turbinate is practically a strip of bone crossing a posterior ethmoid cell. The prominence of the superior turbinate often depends upon the size of a posterior ethmoid cell.

Location of Cells in the Turbinate.—Almost without exception the cell is situated somewhere in the anterior half of the turbinate. If it occupies any part of the posterior half, it is always one of the bullous type of large cells which occupies the anterior half as well (Figs. 24, 28, 37, 38, 45-47). More commonly a single cell is located near the central part of the turbinate in the vicinity of the anterior extremity of the inferior ethmoidal fissure (Figs. 20-23). When the cell is very large, the condition has been called "concha bullosa." Only in this type does the cell extend for any degree to the inferior border or to the inferior angle. In most cases there remains a strip of cancellated bone along the anterior and inferior borders (Fig. 30).

Occasionally the cell may extend towards the superior angle, forming part of a large anterior ethmoid cell, thus reaching the roof of the nasal fossa (Figs. 44, No. 4, 46, Nos. 1, 3, and 5). The frontal sinus may communicate thus with a cell in the turbinate. More often the turbinate cell communicates with a large posterior ethmoidal cell so as to reach the level of the lamina cribroso (Figs. 24, 45, No. 6, 46, No. 2, and 47, Nos. 5 and 6). As a rule, the turbinate cell occupies a position

between the anterior angle and anterior end of the inferior ethmoid fissure encroaching upon the area of the turbinate sinus from in front and above (Figs. 37 and 38).

Types of Cells.—Cells of the turbinate may be classified according to their size, small or large, or according to whether they open into the middle meatus or the inferior ethmoid fissure. The size of cell bears no relation to the situation of its ostium.

Small cells are common near the anterior extremity of the ethmoidal fissure, extending a variable distance into the turbinate; these open into the fissure, and they can be recognized by a small oval prominence on the internal surface of the turbinate (Figs. 3, 20, 21, 23, 45-47). The cavity within the fissure seems to be carried down into the cell.

The cells possessing these characteristics resemble closely in every way anterior and posterior ethmoidal cells.

Another variety of small cells is associated with the sinus turbinalis, and these cells are often multiple. It would seem as though small pockets opening into the sinus became deeper and the ostium smaller until a well recognized cell was formed. They are essentially diverticula from the sinus. The mucous membrane makes these cells more pronounced. These smaller cells opening into the sinus are common and have very little clinical importance. They are near the inferior portions of the turbinate, and do not communicate with the anterior ethmoid cells. Examples are seen in Figs. 37, Nos. 2, 6, 11, 14, 15, and 38, Nos. 3, 5, 6, 11.

The larger cells observed in the inferior ethmoidal turbinate are of fairly common occurrence, and it is to this type that the name "concha bullosa" has been applied. About 5 per cent. of all middle turbinates possess such a cell. It is this condition which is of peculiar surgical importance, and this variety includes most of the clinical cases reported. There is no relation between the size and location of these cells and the location of the ostium.

As a rule, the cell occupies the anterior half of the turbinate, whence it may extend upward or backward according to its size. The turbinate is wide, thus increasing the normal convexity towards the septum nasi, and at the same time encroaching upon the turbinate sinus. The larger cells extend fully to the anterior angle, but sometimes a strip of cancellated bone remains along the inferior and anterior borders (Fig 30). Frequently these cells extend well towards the posterior

angle, and superiorly they may communicate by a large passage with posterior or anterior ethmoid cells, so as to form a large chamber extending to the level of the lamina cribrosa. In many instances these turbinate cells are obviously a part of an ethmoid cell which is situated partly in the lateral mass and the turbinate. Ethmoid cells and frontal sinus may drain into a middle turbinate cell (Figs. 45, No. 3, and 47, Nos. 4, 6). The cells are oval and flattened laterally.

The size of the cells varies. The following table shows the size and relative variations of the three dimensions of some of the larger cells:

Millimeters. Height.	Millimeters. Length.	Millimeters. Width.
18	11	12
17	20	7
20	15	8
14	18	11
20	25	8
8	10	5
31	25	14 (Fig. 24)
17	28	12 (Fig. 28)
25	15	12 (Fig. 22)
19	29	10 (Fig. 38, No. 8)
22	30	11 (Fig. 37, No. 9)

Ostia.—Every ethmoid cell without exception possesses an ostium. An occasional clinical case has been reported where it is claimed that the cell possessed no ostium, and the reason for such conclusion is readily understood when the location of the ostium is considered.

Location.—Whenever the cell opens above the middle turbinate bone into what is usually called the superior meatus of the nose, the location of the ostium is constant, irrespective of the size of the cell. It is situated at the extreme anterior end of the inferior ethmoidal turbinate, more or less concealed, when viewed laterally, by the lamina of the superior turbinate (Figs. 21 and 24). It is oval and from two to four millimetres in diameter. The ostium of a large cell does not differ much in any respect from that of a small cell. In all instances it is placed at about the highest level of the cavity, and therefore it is most unfavorably placed to facilitate drainage from any cell within the turbinate. All turbinate cells which communicate directly with posterior ethmoid cells open thus. Of

all turbinate cells about forty-five per cent. open into the inferior ethmoidal fissure *i. e.*, the region commonly termed the superior meatus.

Middle turbinate cells may open below the turbinate into the middle meatus, and of all cases about fifty-five per cent. communicate thus with the nasal fossa. A few of the smaller cells may open into any portion of the turbinate sinus, but these are usually small diverticula from the sinus and of comparatively slight importance. The ostium of the larger cells occupies a very constant position on the external surface just above the turbinate sinus. It is opposite a point above and anterior to the upper portion of the ethmoid bulla (Figs. 22, 29, 30, and 33). In shape it is commonly crescentic with the convexity downward, and may measure from three to ten millimetres in length. Its plane is parallel to that of the turbinate, but the plane of the ostium opening above the turbinate is at a right angle to that of the turbinate. This type of ostium is at the upper portion of the cell and offers poor drainage. A somewhat larger percentage of the bullous type of cell opens into the middle meatus. It is the cells opening by this route that communicate with the anterior ethmoid cells, the frontal sinus, and frontal bulla.

If a bullous turbinate is removed by snare or forceps, the line of fracture is below or through the ostium, hence the removed portion may contain a large cell without any apparent ostium.

The disposition of the ostia varies when multiple cells are present in the same turbinate. Both cells never open above but both may open below (Fig. 47, No. 1) the turbinate, or there may be an ostium on either side (Figs. 23 and 45, No. 5). When the cells are arranged one in front of the other, the anterior cell generally opens into the middle meatus, the posterior into the superior meatus (Fig. 23). Of thirteen turbinates containing comparatively large double cells, in no instance did both cells open above the turbinate, but in three cases both communicated with the middle meatus, and in ten cases one cell opened above and the other below the turbinate. Occasionally the turbinates of opposite sides contain a cell, both communicating with the nasal fossa by the same (Fig. 36) or different (Fig. 33) routes.

The walls of the cells vary in thickness within narrow limits. The lateral walls are usually thinner than the wall of an ordinary turbinate, and if the cell is of the bullous type and

extends fully to the anterior border, the front wall is equally thin. Where the cell is small and occupies the upper portion of the turbinate, the proper lateral walls of the cell are thin, but the remaining portion of the lamella of the turbinate is unchanged. Partitions between cells are thin.

The mucous membrane which lines these cells does not differ from that lining the general cavity in the ethmoid region. It is devoid, however, of the erectile tissue which is characteristic of the internal surface of the turbinate. It consists of cilated columnar epithelium and basement membrane, together with some loose connective tissue in which are distributed lymph and blood vessels and glands. The osseous tissue is characteristic of that belonging to the ethmoid bone. As a result of pathological processes, such as catarrhal inflammation, hypertrophy, polyps, and atrophy, the appearance of the mucous membrane may be profoundly altered.

Relation of Cells to Surrounding Structures.—Internal to the cells is the septum nasi (Figs. 30 and 35), and, according to the size of the cell and the angle of the turbinate and the curvature of the septum, the cell may be in contact with the septum. Adhesions are rare.

External to the cell we have the bulla and uncinate process, together with the important ostia in the vicinity. A cell of any considerable width is apt to obstruct these ostia, giving rise to symptoms according to the ostium involved. There is no structure immediately in front of the cell, but posteriorly there is often a portion of the bulla, if prominent, and the accentuated concavity of the turbinate sinus (Figs. 37 and 38).

Recognition of the Presence of Middle Turbinate Cells.—The vicinity of the anterior angle of the middle turbinate is practically always in view when examined from the anterior nares. An unusual width of this region may be due to a deviation or undue curling of the turbinate or to the presence of a cell . The bullous type can be seen filling up the apertura pyriformis (Fig. 27), and perhaps obstructing the olfactory fissure, or even extending from the septum to the bulla. Only in exceptional instances could the presence of a cell be detected by posterior rhinoscopy (Fig. 31). The location of the ostium could not be determined in a normal cell.

Origin of Cells in the Inferior Ethmoidal Turbinate.—Embryology shows that at birth there are no cells associated with the ethmoid bone (Fig. 26); that at four to five years cells begin to develop by the pushing in of pockets lined with

mucous membrane (Fig. 25); that at puberty the ethmoid cells are fully developed; that the cells do not change materially in health, but that in the aged they may become a little larger in consequence of atrophy of their walls. The inferior ethmoidal turbinate or "middle turbinate" is a porition of the ethmoid bone, and its development depends upon that of the rest of the bone.

Anatomical research of a large number of normal middle turbinates reveals the following facts: That in about 9 per cent. of all turbinates examined bony cells were present; that these cells frequently communicated with either anterior or posterior ethmoid cells, and were occasionally multiple; that the cell could lie partly in the lateral mass and partly in the turbinate; that the structure and appearance of the cells resemble those of ethmoid cells; that the cells very rarely showed the presence of any pathological process; that all these cells have ostia; that frequently the superior turbinate consisted of a narrow lamella or a sharp ridge on a posterior ethmoid cell. No closed bone cavities or bone cysts were discovered in any of the turbinate bones.

There are two theories among clinicians as to the formation of cavities or cells in the inferior ethmoidal turbinate:

(1) That these are closed osseous cystic cavities produced by an inflammatory process giving rise to an exaggerated curling of the bony lamella until it has formed a bony cavity or osseous cyst. In these instances there is claimed to be an absence of lining mucous membrane and a particular arrangement of osteoclasts and osteoblasts.

(2) That these cells already exist in the turbinate as normal structures, and may be the site of subsequent inflammation with consequent pathological changes.

The following conclusions are drawn as regards the occurrence of these turbinate cells, based chiefly on anatomical investigation:

That the presence of turbinate cells in 9 per cent. of all cases is not a pathological condition; that these cells are normal in every respect; that they are usually not large, but that even the largest cells do not differ from the anterior and posterior ethmoid cells, and develop in the same way and are really ethmoid cells; that the presence of most of the cells could not give rise to any symptoms, but that even without any pathological changes the cell may become large enough to cause obstruction to respiration, to interfere with the sense

of smell, and to give rise to reflex symptoms in consequence of pressure; that as a result of inflammation secondary changes may take place in the mucous lining and also in the bony wall of the cell, whereby its general character and size may be altered, particularly when the ostium becomes closed; that cells of considerable size must exist without their presence being known until the patient seeks relief for nasal obstruction, when a cell may be discovered complicating an acute catarrhal process which was just enough to make complete an already partial obstruction; that in cases of empyema of such a cell where the ostium remains closed, we have practically an abscess cavity, the walls of which are capable of great distention.

THE CLINICAL HISTORY OF MIDDLE TURBINATE CELLS.

The salient clinical features of these cases will be reviewed briefly, based upon the reported cases and a recent well-marked example occurring in the practice of the writer.

Occurrence.—There are about thirty authentic cases on record. All cases occurred practically in adults, the youngest patient being 16 years old. Although about three-fourths occurred in females, there is no reason why one sex should be prone to the condition. More than half the cells contained air and the walls were not the seat of any pathological process. There were five well-marked examples of empyema of the cells, while other cases were complicated by the presence of hypertrophied tissue and polypi within the cavity. They were about equally distributed on either side, and in two instances both middle turbinates were involved.

Symptoms.—In all probability most turbinate cells give rise to no symptoms. They are subject to the same changes undergone by other ethmoid cells in health and disease.

There are two general groups of symptoms which may be caused by middle turbinate cells—one due to the size of the cell, the other due to the presence of inflammation. Both factors may be present simultaneously. The cell may be of sufficient *size* to cause the following symptoms:

There may be complete or partial obstruction to respiration, generally unilateral, which persists irrespective of the presence or absence of a rhinitis. This gives a sense of pressure. Mouth breathing may be necessary.

Pain is often referred to one side of the face and is of a neuralgic character. This may be distributed along any of the branches of the trifacial nerve, manifested as pain along

the supra-orbital nerve, about the eye, or in the teeth of the superior maxilla.

There may be a nasal quality to the voice.

The sense of smell may be interfered with.

There may be headache and occasionally dyspnœa on exertion.

Reflex nervous symptoms have been reported as due to the pressure of the turbinate on neighboring structures.

No authentic reports of external nasal deformity due simply to an enlarged turbinate cell are on record. Such enlargement may cause a deviation of the septum and distort the structures external to the cell, causing secondary symptoms in the antrum and frontal sinus. Photophobia, epiphora, and exophthalmos are said to accompany the condition.

In general it may be said that a non-inflamed turbinate cell causes no symptoms, but that otherwise the chief complaint is that of unilateral nasal obstruction with a sense of fulness and some pain in the nose.

Whenever such a cell becomes inflamed the character of the symptoms changes. Until the onset of these symptoms there may have never been any trouble caused by the cell. The symptoms due to inflammation may supervene on those already existing in consequence of pressure. The symptoms of acute rhinitis with obstinate nasal obstruction commonly cause the patient to seek medical advice, when the true condition may be observed for the first time. The obstruction may remain obstinate, and if the ostium is occluded, an empyema of the cell follows because the retained contents of the cell become infected. The usual changes due to suppuration in mucous membranes follow, until eventually the cell ruptures with or without bony rarifaction and cell enlargement. The persistence of hypertrophy and polypoid degeneration favor the obstruction and suppurative process, and the nasal discharge persists. Crusts collect and there may be odor. A suppurative process well established in such a cell is apt to become chronic because of the unfavorable location of the ostium for drainage.

Diagnosis.—It is usually difficult to diagnose the presence of a small middle turbinate cell which is not the source of any discomfort. If the cell is in the upper portion of the turbinate, its presence cannot be established. Only the bullous type of cell can be determined with any degree of satisfaction. Through the anterior nares, a tumor presents in the apertura pyriformis, with rounded outline and occupying the position of

the inferior ethmoidal turbinate ("middle turbinate"). A small probe can be made to pass between it and the nasal septum and externally between the tumor and the outer nasal wall. It is immovable and hard, although its covering mucous membrane may be hypertrophied. The wall may be thin and bend under the pressure of the probe. The diagnosis is confirmed if a probe or other instrument breaks through the wall and enters a cell cavity. Pus may be made to escape from an opening made in the cell in cases of empyema. In a case of empyema of the bullous type of cell, operated recently by the writer, the cell wall was thin and very membranous. In this instance, pressure on the cell with a probe caused an excess of pus to escape from well above the turbinate, showing that the ostium was situated at the inferior ethmoidal fissure. The diagnosis of the presence of multiple cells would be very difficult.

A differential diagnosis should include the following conditions, which will be simply enumerated: Polypi. Hypertrophy of mucous membrane. An abnormally prominent ethmoid bulla or other ethmoid cell. Cysts of the mucous membrane of the turbinate. Abnormally broad curvature of the turbinate. Malignant tumor. Osteoma of turbinate. Cell of turbinate.

Treatment.—The treatment of any condition due to the presence of a cell in the inferior ethmoidal turbinate presents no difficulties and offers the hope of permanent relief. The part can be thoroughly anæsthetized by means of cocaine, and the hemorrhage carefully controlled during operation by means of a solution of adrenaline chloride.

The cell may be removed by means of the snare or any cutting instrument. It is probably wise to remove all of the cell. This can be done at one time with the snare, provided the cell is small; but if the cell is very large, a portion of it usually remains behind. This may be removed subsequently with cutting forceps, or, if it does not press on the structures laterally, it may be left after the interior has been carefully curetted.

Fig. 1.—Outer bony wall of left nasal fossa; dotted line marks the roof of fossa. **F,** frontal sinus; **S,** sphenoidal sinus; **n,** nasal bone; **n. p.,** nasal process of superior maxilla; **a, a,** broken anterior ethmoid cells; **p,** posterior ethmoid cells; **s. p.,** sphenopalatine foramen; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate; **A,** hiatus leading to antrum; **U,** uncinate process; **m.m.,** middle meatus; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 2.—Outer bony wall of right nasal fossa; dotted line marks the roof. **F,** frontal sinus; **S,** sphenoidal sinus; **s.p.,** sphenopalatine foramen; **f.e.i.,** inferior ethmoid fissure. Arrow enters a posterior ethmoid cell from a middle ethmoid fissure. **a,** an anterior ethmoid cell which makes a frontal bulla; **n,** nasal bone; **n.s.,** nasal spine of frontal bone; **n.p.,** nasal process of superior maxilla; **m.t.,** middle turbinate bone; ....., middle meatus; **U,** uncinate process; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 3.—Outer bony wall of left nasal fossa. **F, F,** frontal sinus; **S,** sphenoidal sinus; **n,** nasal bone; **n.p.,** nasal process of superior maxilla; **s.e.,** spheno-ethmoidal recess; **p,** ostium of a posterior ethmoidal cell; **s. p.,** sphenopalatine foramen; **f.e.i.,** fissura ethmoidalis inferior, from which an arrow passes forward through an ostium into an anterior ethmoid cell just above the middle turbinate; **m.t.,** middle turbinate; **g,** groove on internal surface of middle turbinate; **m.m.,** middle meatus; **U,** uncinate process; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 4.—Outer bony wall of right nasal fossa. **F,** frontal sinus; **S,** sphenoidal sinus; **s.e.,** spheno-ethmoidal recess; **n,** nasal bone; **n.p.,** nasal process of superior maxilla; **s.p.,** sphenopalatine foramen; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate; **O,** operculum; **m.m.,** middle meatus; **i.t.,** inferior turbinate; **i.m.,** inferior meatus; **a.n.,** agger nasi; **c.g.,** crista galli.

Fig. 5.—Outer bony wall of left nasal fossa. **F**, frontal sinus; **S**, sphenoidal sinus, into which passes an arrow through the ostium sphenoidale; **a.e.**, spheno-ethmoidal recess; **s.p.**, sphenopalatine foramen; **s.t.**, superior turbinate; **f.e.i.**, fissura ethmoidalis inferior; **m.t.**, middle turbinate; **O**, operculum; **a.n.**, agger nasi; **i.t.**, inferior turbinate; **i.m.**, inferior meatus; **n**, nasal bone; **n.p.**, nasal process of superior maxilla.

Fig. 6.—Outer bony wall of left nasal fossa; dotted line marks the roof. **F,** frontal sinus; **S,** sphenoidal sinus, into which an arrow enters through the ostium sphenoidale; **c.g.,** crista galli; **s.p.,** sphenopalatine foramen; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate; **O,** operculum; **m.m.,** middle meatus; **A,** hiatus leading to antrum; **i.t.,** inferior turbinate; **i.m.,** inferior meatus; **n,** nasal bone; **n.p.,** nasal process of superior maxilla.

Fig. 7.—Outer bony wall of left nasal fossa. **F**, frontal sinus; **S**, sphenoidal sinus, into which an arrow points passing through the ostium sphenoidale; **n**, nasal bone; **n.p.**, nasal process of superior maxilla; **b.p.**, broken posterior ethmoid cells; **s.t.**, superior turbinate; **f.e.i.**, fissura ethmoidalis inferior; **s.p.**, sphenopalatine foramen; **m.t.**, middle turbinate; **U**, uncinate process; **m.m.**, middle meatus; **i.m.**, inferior meatus; **i.t.**, inferior turbinate.

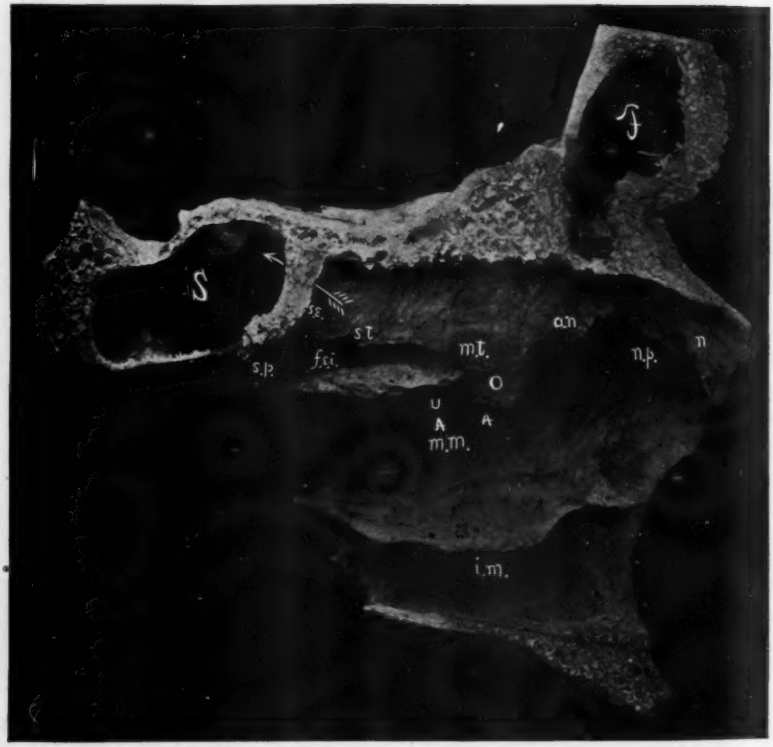

Fig. 8.—Outer bony wall of left nasal fossa. **F,** frontal sinus; **S,** sphenoidal sinus, with arrow directed through ostium sphenoidale; **n,** nasal bone; **n. p.,** nasal process of superior maxilla; **a.n.,** agger nasi; **c.g.,** crista galli; **s.t.,** superior turbinate; **m.t.,** middle turbinate; **O,** operculum; **i.t.,** inferior turbinate; **s.e.,** spheno-ethmoidal recess; **f.e.i.,** fissura ethmoidalis inferior; **s.p.,** spheno-palatine foramen; **m.m.,** middle meatus; **U,** uncinate process; **A, A,** bony hiatus leading to antrum; **i.m.,** inferior meatus.

Fig. 9.—Outer bony wall of right nasal fossa; dotted line marks its roof. **F**, frontal sinus; **S**, sphenoidal sinus; **n**, nasal bone; **n.p.**, nasal process of superior maxilla; **s.p.**, sphenopalatine foramen; **m.t.**, middle turbinate; **O**, operculum; **g**, deep groove in middle turbinate; **f.e.i.**, fissura ethmoidalis inferior; 1 and 2, two superior turbinate bones with a deep middle ethmoidal fissure between them; **m.m.**, middle meatus; **i.t.**, inferior turbinate; **i.m.**, inferior meatus.

Fig. 10.—Outer bony wall of right nasal fossa; dotted line marks the roof. F, frontal sinus; S, S, sphenoidal sinus, just in front of which an arrow enters a posterior ethmoid cell; f.e.i., fissura ethmoidalis inferior; m.t., middle turbinate; m.m., middle meatus; i.t., inferior turbinate; i.m., inferior meatus.

Fig. 11.—Outer bony wall of right nasal fossa; dotted line marks its **roof.** **S,** sphenoidal sinus; **s.e.,** spheno-ethmoidal recess; **s.t.,** superior turbinate; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate, showing several depressions. Inferior border measures forty-three millimetres, the anterior border twenty-nine millimetres. **m.m.,** middle meatus; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

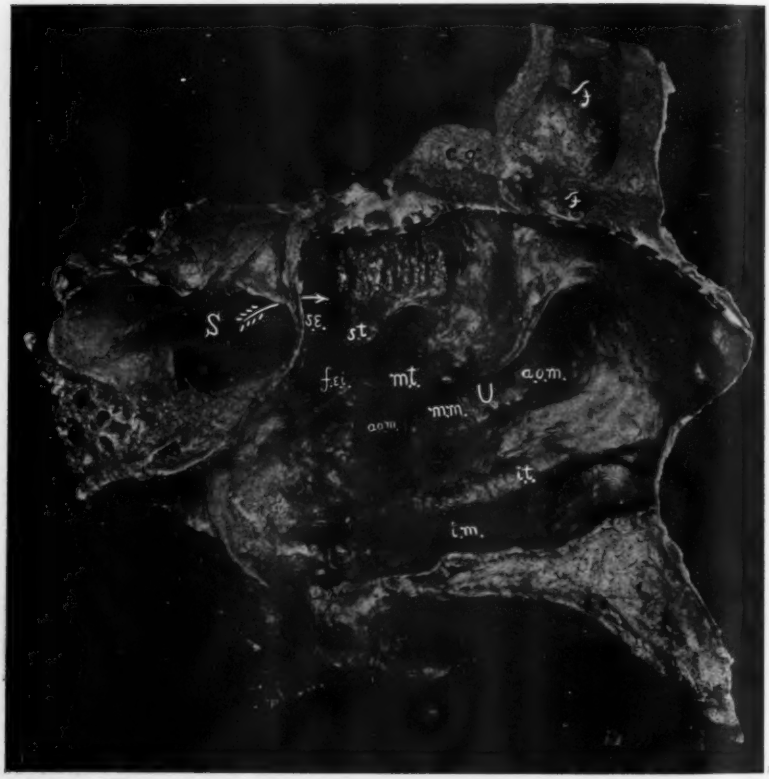

Fig. 12.—Outer wall of left nasal fossa; dotted line marks its roof. F, F, frontal sinus; **S,** sphenoidal sinus, with arrow entering nasal fossa through the ostium sphenoidale; **s.e.,** spheno-ethmoidal recess; **s.t.,** superior turbinate; **f.e.j.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate. Inferior border measures thirty-eight millimetres, the anterior border, twenty-two millimetres. **m.m.,** middle meatus; **U.** uncinate process; **a.o.m.** two accessory ostia of the antrum; the normal ostium is just above **m.m.** under cover of the turbinate. Diameter of larger ostium measures eleven millimetres. **i.t.,** inferior turbinate; **i.m.,** inferior meatus; **c.g.,** crista galli on section.

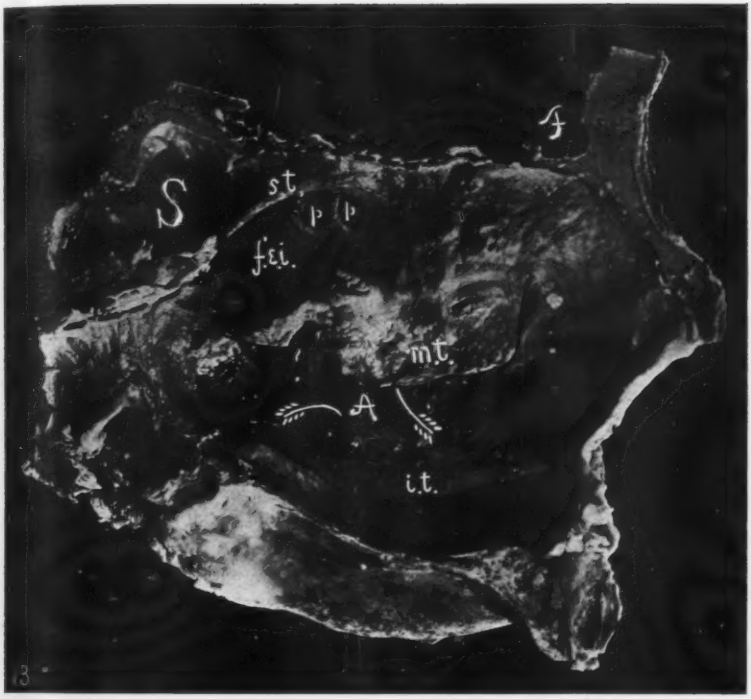

Fig. 13.—Outer wall of left nasal fossa; dotted line marking its roof. **F**, frontal sinus; **S**, sphenoidal sinus; **s.t.**, small atrophic superior turbinate; **p.p.**, ostia of posterior ethmoid cells; **f.e.i.**, wide fissura ethmoidalis inferior; **m.t.**, middle turbinate deeply notched; **i.t.**, inferior turbinate; **A**, very large accessory ostium, through which arrows pass to antrum; its diameter measures twenty millimetres.

Fig. 14.—Outer wall of right nasal fossa; dotted line marks its roof. **F, F,** frontal sinus; **c.g.,** crista galli, which is hollow and communicates with the frontal sinus; **P,** posterior ethmoid cell. Arrow passes from a sphenoidal sinus through its ostium sphenoidale. **m.t.,** middle turbinate relatively very large. Mucous membrane hypertrophied. Inferior border, fifty millimetres; anterior border, thirty-three millimetres; height of nasal fossa, forty-six millimetres. **O,** operculum prominent; 1 and 2, two superior turbinate bones with a middle ethmoidal fissure between; **f.e.i.,** inferior ethmoidal fissure; **a.o.m.,** accessory ostium maxillare; **i.t.,** inferior turbinate.

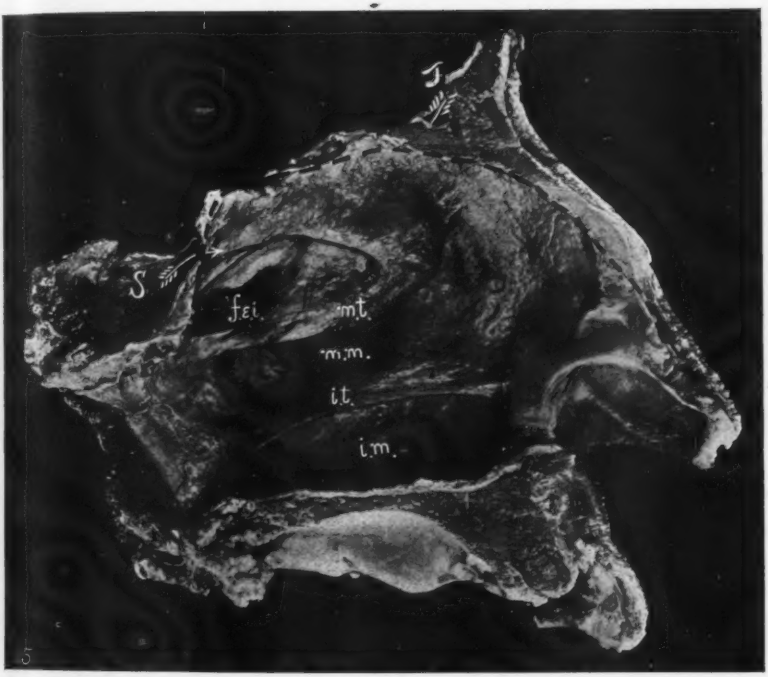

Fig. 15.—External wall of left nasal fossa; dotted line marks its roof. **F,** frontal sinus, with arrow passing towards the ostium frontale; **S,** sphenoidal sinus, with arrow passing through the ostium sphenoidale; **f.e.i.,** opposite a wide ostium of a posterior ethmoid cell. The ethmoidal fissure is high and limited above by a narrow, dark line which marks the border of the atrophied superior turbinate. **m.t.,** middle turbinate, showing the ethmoid fissure running well forward. Inferior border measures forty-eight millimetres, the anterior border, twenty-eight millimetres. **m.m.,** middle meatus; **i.t.,** much atrophied inferior turbinate; **i.m.,** inferior meatus.

Fig. 16.—Outer wall of right nasal fossa; dotted line marks its roof. Specimen shows a most extreme degree of atrophy. **F,** frontal sinus, with arrow which reappears after passing through the ostium frontale under the middle turbinate; **m.t.,** a very short atrophied middle turbinate which consists chiefly of a membraneous fold measuring five millimetres long; **B,** ethmoid bulla, below which an arrow passes through the ostium maxillare into a small antrum; **U,** uncinate process; **s.t.,** atrophied superior turbinate; **f.e.i.,** fissura ethmoidalis inferior; **i.t.,** inferior turbinate, much atrophied.

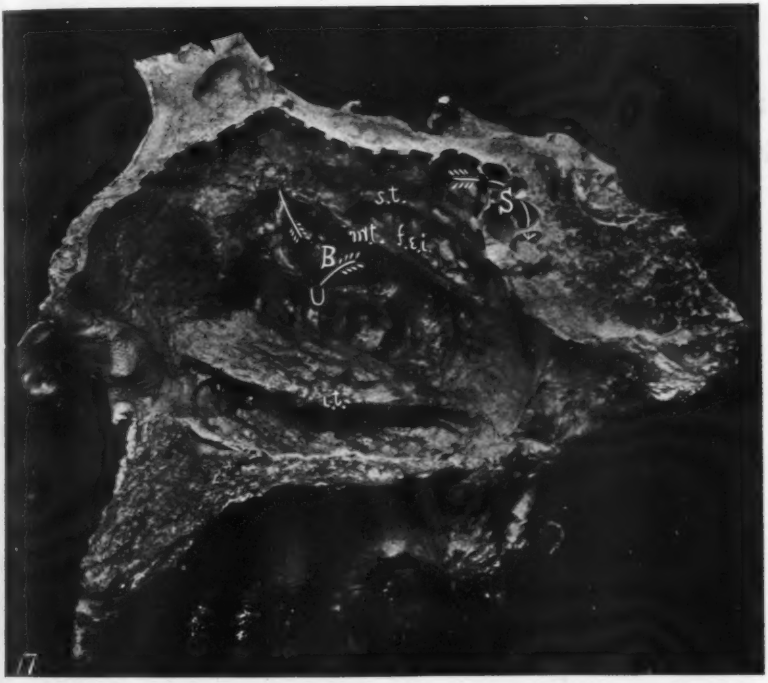

Fig. 17.—Outer wall of right nasal fossa showing an extreme degree of atrophy; dotted line marks roof of fossa. **S,** sphenoidal sinus, small and subdivided by cellular partitions. Arrow enters sinus through the ostium sphenoidale; **s.t.,** much atrophied superior turbinate; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** extreme atrophy of middle turbinate which consists chiefly of a fold of membrane without bone tissue; **B,** ethmoid bulla, above which is its ostium; anteriorly is an arrow leading to the frontal sinus; **U,** uncinate process, behind which an arrow passes through the ostium maxillare to a very small antrum; **i.t.,** inferior turbinate.

Fig. 18.—Outer wall of right nasal fossa; dotted line marks the roof. **F,** frontal sinus; **S,** sphenoidal sinus, with arrow pointing through the ostium sphenoidale; 1 and 2, two small superior turbinates; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate, on the inner aspect of which is a deep groove (**g**) thirty-six millimetres long and five millimetres high and deep; **m.m.,** middle meatus, with arrow passing through the ostium maxillare to antrum; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 19.—Outer wall of left nasal fossa; dotted line marks the roof. **F**, frontal sinus; **f.b.**, an anterior ethmoid cell making a frontal bulla; **S**, sphenoidal sinus, arrow passing through the ostium sphenoidale; **f.e.i.**, fissura ethmoidalis inferior, which extends forward as a deep groove (**g**) on the inner surface of middle turbinate (**m.t.**). Inferior border of the turbinate measures forty-eight millimetres, the anterior border, twenty millimetres. **m.m.**, middle meatus; **i.t.**, inferior turbinate; **i.m.**, inferior meatus.

Fig. 20.—Outer wall of left nasal fossa; dotted line marks its roof. **F,** frontal sinus; **S,** sphenoidal sinus, with arrow passing through the ostium sphenoidale; **s.e.,** sphenoethmoidal recess; **f.e.i.,** fissura ethmoidalis inferior; **m.t.,** middle turbinate, containing a cell (e) showing an arrow entering its ostium from the middle meatus; **m.m.,** middle meatus; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 21—Outer wall of left nasal fossa; dotted line marks its roof. **F**, frontal sinus; **S**, sphenoidal sinus, with arrow through its ostium; **s.t.**, superior turbinate; **m.t.**, middle turbinate; **c**, cell in middle turbinate, with arrow entering its ostium from the inferior ethmoidal fissure; **a.o.m.**, accessory ostium maxillare; **i.t.**, inferior turbinate.

Fig. 22.—Outer wall of left nasal fossa; dotted line marks its roof. **F.** frontal sinus; **S,** sphenoidal sinus, arrow passes through its ostium; **s.e.,** spheno-ethmoidal recess; **s.t.,** superior turbinate; **f.e.l.,** inferior ethmoidal fissure prolonged as a groove (**g**) on the middle turbinate (**m.t.**); **m.m.,** middle meatus, with arrow passing into a large cell in the middle turbinate bone (**c**). The inner wall of this cell has been removed, exposing a swelling (**a**) which passes into this cell. This swelling is an unusually formed anterior ethmoid cell, into which an arrow is made to pass; it is fifteen millimetres long. The middle turbinate cell measures fifteen millimetres long, twenty-five millimetres high, and twelve millimetres wide. Inferior border of turbinate measures fifty-five millimetres, and the anterior border, thirty millimetres. **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 23.—Outer wall of right nasal fossa; dotted line marks its roof; double cells in the turbinate. **F**, frontal sinus, membrane just exposed without opening the sinus; **S**, small sphenoidal sinus, with arrow through its ostium; **s.e.**, spheno-ethmoidal recess; **p**, posterior ethmoidal cell, with arrow passing through its ostium into the inferior ethmoidal fissure (**f.e.i.**); 1 and 2, two superior turbinate bones; **m.t.**, middle turbinate with operculum (**O**). Inferior border, forty-five millimetres; anterior border, twenty-eight millimetres. **c.c.**, two cells in middle turbinate with inner wall removed. The anterior one opens into the middle meatus as shown by arrow; the posterior one opens into the ethmoidal fissure above the middle turbinate, and also communicates with the posterior ethmoid cells which extend to the roof of the fossa. The anterior cell is seven millimetres long, seventeen millimetres high, and five millimetres wide; the posterior cell is ten millimetres long, nineteen millimetres high, and six millimetres wide. **i.t.**, inferior turbinate; **i.m.**, inferior meatus.

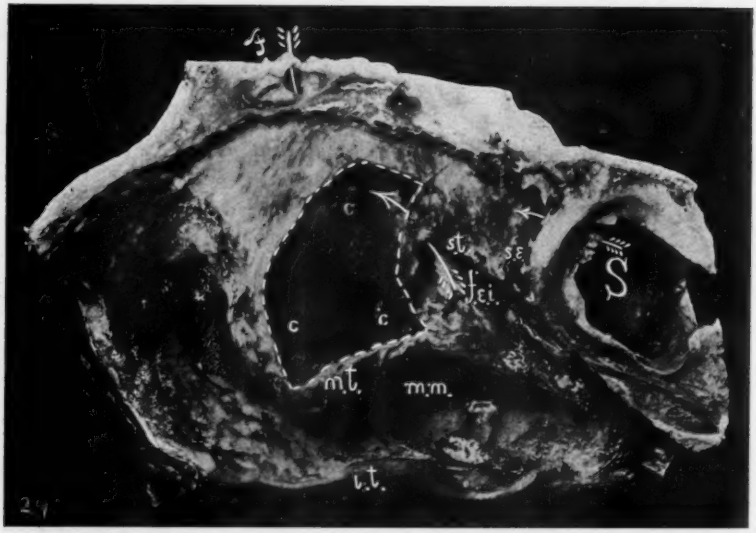

Fig. 24.—Outer wall of right nasal fossa exposing a very large hollow, middle turbinate. The inner wall removed, exposing its cavity (**c, c**), into which an arrow passes through its ostium from the inferior ethmoidal fissure (**f.e.i.**). This cell measures twenty-five millimetres long, thirty-one millimetres high, and fourteen millimetres wide. The height of the turbinate is thirty-five millimetres. **F,** frontal sinus, with arrow passing to middle meatus (**m.m.**); **s.t.,** superior turbinate; **S,** sphenoidal sinus, with arrow passing through its ostium; **s.e.,** spheno-ethmoidal recess; **i.t.,** inferior turbinate.

Fig. 25.—Outer wall of right nasal fossa; child, five years of age. **F**, small frontal sinus; **S**, spongy tissue in body of sphenoid bone corresponding to site of sphenoidal sinus; 1 and 2, two superior turbinate bones; **m.t.**, middle turbinate with its operculum (**O**). Inferior border measures thirty millimetres; anterior border, sixteen millimetres. **m.m.**, middle meatus; **i.t.**, inferior turbinate; **i.m.**, inferior meatus; **i**, incisor tooth of permanent set prior to eruption.

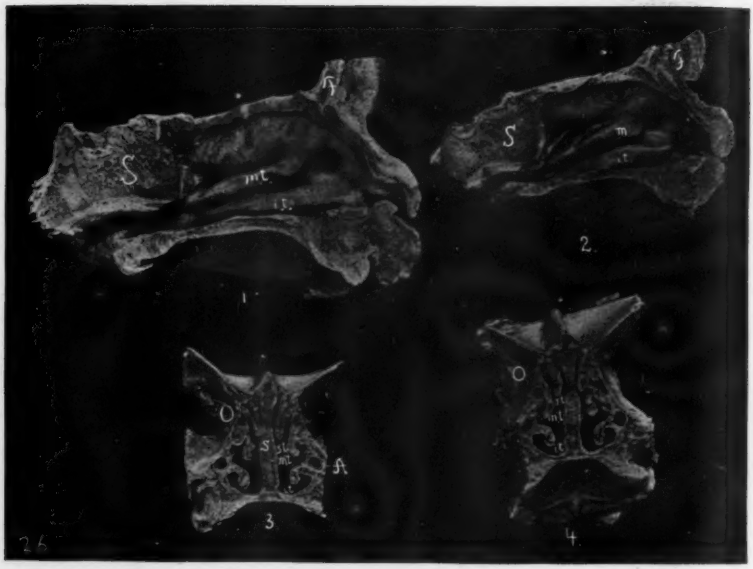

Fig. 26.—Nasal fossa of infant at birth; mucous membrane smooth and comparatively thick.

Nos. 1 and 2, outer wall of left fossa. F,cancellated tissue at site of undeveloped frontal sinus; S, site of undeveloped sphenoidal sinus; m.t., middle turbinate; i.t., inferior turbinate.

Nos. 3 and 4, transverse sections showing turbinates and meatuses. O, orbital fossa; s.s., septum nasi; s.t., superior turbinate; m.t., middle turbinate; i.t., inferior turbinate; A, antrum.

Fig. 27.—Front view of anterior nares, showing a slight deviation of the septum (**s**) to the left in consequence of a large cellular middle turbinate (**m.t.**). This turbinate occluded the right nasal fossa except for a narrow space along the floor, and contains the largest cell observed in all the specimens examined compared with the size of the fossa. The very large size of the turbinates is due to the presence of very thick walls and of a large cell. **i.t.**, inferior turbinate. See Figs. 28 and 29.

Fig. 28.—Outer wall of right nasal fossa; specimen shown in Figs. 27 and 29. **m.t.**, lateral view of a very large middle turbinate. A faint vertical line through the **m** shows where this specimen is divided for Fig. 29. A large cell with thick walls which opens into the middle meatus occupies the anterior two-thirds of the turbinate. It measures twenty-eight millimetres long, seventeen millimetres high, and twelve millimetres wide. The turbinate is large and bold; its inferior border measures sixty-five millimetres, its anterior border forty-five millimetres. **O**, prominent operculum; **F**, frontal sinus; **S**, sphenoidal sinus, with arrow entering through the ostium sphenoidale; **s.e.**, spheno-ethmoidal recess; **p**, is placed on the inner wall of a posterior ethmoid cell; **s.t.**, superior turbinate; **f.e.i**, fissura ethmoidalis inferior; **m.m.**, middle meatus; **i.t.**, inferior turbinate.

Fig. 29.—Transverse section of right lateral half of specimen shown in Figs. 27 and 28 just anterior to the ostium maxillare; the anterior half is rotated outward so as to expose both cut edges, left nasal fossa is intact. **O, O,** orbital fossa; **m.t.,** middle turbinate, anterior and posterior portions; **c, c,** coresponding halves of the large cell contained within the turbinate. An arrow marks its ostium into the middle meatus. It is so situated that its holding capacity for fluids with the head erect is considerable; **O,** operculum; **F,** frontal sinus, near which is an arrow entering the sinus just anterior to an anterior ethmoidal cell (**a**) which forms a frontal bulla. The posterior half shows the remaining part of this cell. **o.p.,** os planum of ethmoid bone; **A, A,** comparatively small antrum, with an arrow passing out of its ostium directly towards the frontal sinus; **U,** uncinate process, above which is a cell space carried forward and marked **a** in the anterior half and known as the infundibulum. **i.t.,** inferior turbinate; **s,** nasal septum, showing injected arteries.

Fig. 30.—Transverse section just anterior to the ostium maxillare. F, frontal sinuses, with arrows passing through their ostia directly into the middle meatus without entering the infundibulum (i); a, a, anterior ethmoid cells; A, antrum. Arrows pass into the infundibulum (i) through the ostium maxillare, thence through the hiatus semilunaris into the middle meatus under the middle turbinate bone. U, uncinate process, which is placed obliquely and forms the internal wall of the infundibulum; s, septum nasi; m.t., middle turbinate. On the left side this turbinate contains a cell (c) which communicates with the middle meatus, as shown by an arrow. i.t., inferior turbinate; o.p., os planum.

Fig. 31.—Transverse section at the posterior extremity of the middle turbinate bones. The section shows the horizontal aspect of the posterior half of the turbinate (**m.t.**). **S**, right sphenoidal sinus, with arrow passing through its ostium into the nasal fossa. Only a small portion of the left sinus appears, and to the left is a large posterior ethmoidal cell (**p**). **s.t.**, superior turbinate; **s**, septum nasi; **i.t.**, inferior turbinate.

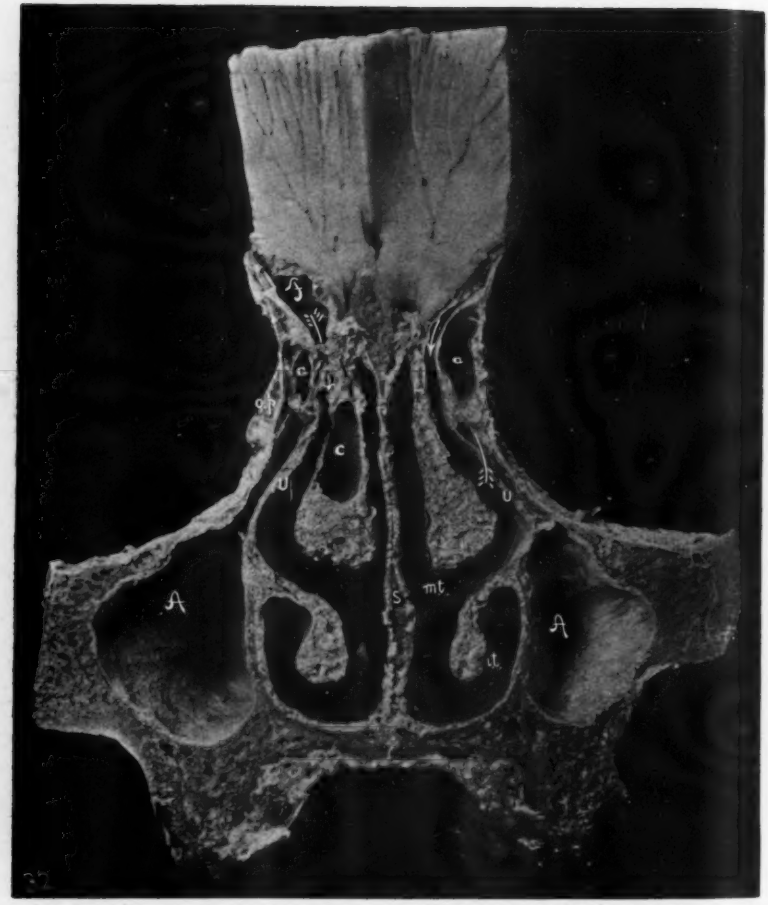

Fig. 32.—Transverse section at the ostium maxillare. (See Fig. 33.) F, left frontal **sinus, with arrow passing through its ostium into the turbinate fossa. A similar arrow emerges from the right sinus. o.p.,** os planum; **a. a,** anterior ethmoid cells; **m.t.,** middle **turbinate bodies. unique in that they consist of very dense bone tissue measuring ten millimetres in width. They contain a cell (c) which is larger in the left turbinate, but the cell in the right turbinate is located so far posteriorly as to appear in the posterior half (Fig. 33). U,** uncinate process. On the right side an arrow passes forward in the **infundibulum which ends blindly in a cell; s,** septum nasi; **i.t.,** inferior turbinate; **A,** antrum.

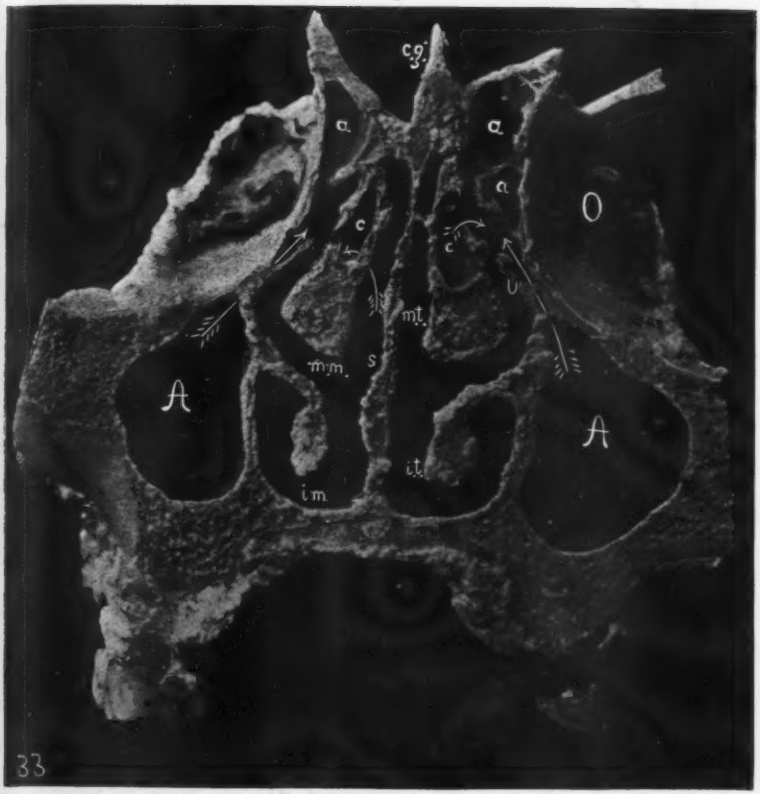

Fig. 33.—Posterior half of specimen shown in Fig. 32. **m.t.**, middle turbinate bodies characterized by much dense bone tissue, above which is a cell (**c**). The cell in the right turbinate opens into the inferior ethmoid fissure as shown by the arrow, that in the left turbinate opens into the middle meatus; **c.g.**, crista galli; **a.** anterior ethmoid cells; **O**, orbital fossa; **m.m.**, middle meatus; **s**, septum nasi; **i.t.**, inferior turbinate; **i.m.**, inferior meatus; **A**, antrum. Arrows pass through the ostium maxillare into the infundibulum and terminate at the hiatus semilunaris. **U**, uncinate process.

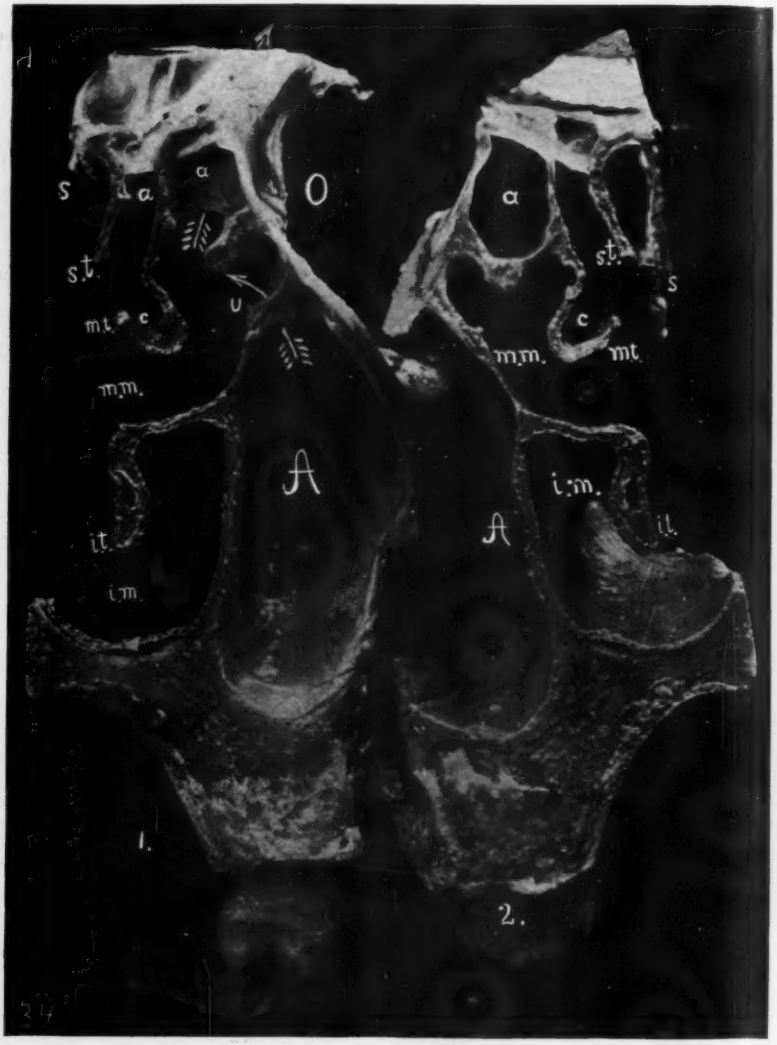

Fig. 34.—Transverse section of right nasal fossa. septum (**s**) fragmentary. The two halves of this specimen are placed side by side. 1, anterior half; 2, posterior half; **s,** septum nasi; **s. t.,** superior turbinate; **a,** anterior ethmoid cells. In 1 an arrow passes forward from the turbinate fossa into the frontal sinus, and a second arrow from the antrum (**A**) into the infundibulum; the antrum is large. **O,** orbital fossa; **m.t.,** middle turbinate in this specimen is unique in that it presents a deep concavity (**c**) on its internal surface; **m.m.,** middle meatus; **i.t.,** inferior turbinate; **i.m.,** inferior meatus.

Fig. 35.—Horizontal section above the level of the ostium maxillare, lower half of specimen shown in Fig. 36. **A,** antrum, with arrows indicating the position of the ostium maxillare and lying in the infundibulum; **U,** uncinate process; the cavity just external to the letter is the infundibulum; **a, a,** anterior ethmoid cells; **p,** posterior ethmoid cells; **s,** septum nasi; **O,** orbital fossa; **m.t.,** middle turbinates. The posterior half of each turbinate is horizontal; the anterior half is vertical, and in each instance the turbinate contains a cell (**c**). The ostium of these cells is shown in Fig. 36. The dark space external to these turbinates is the middle meatus, and the long, dark area internal to the turbinates divided by the septum is the general cavity of the nasal fossa.

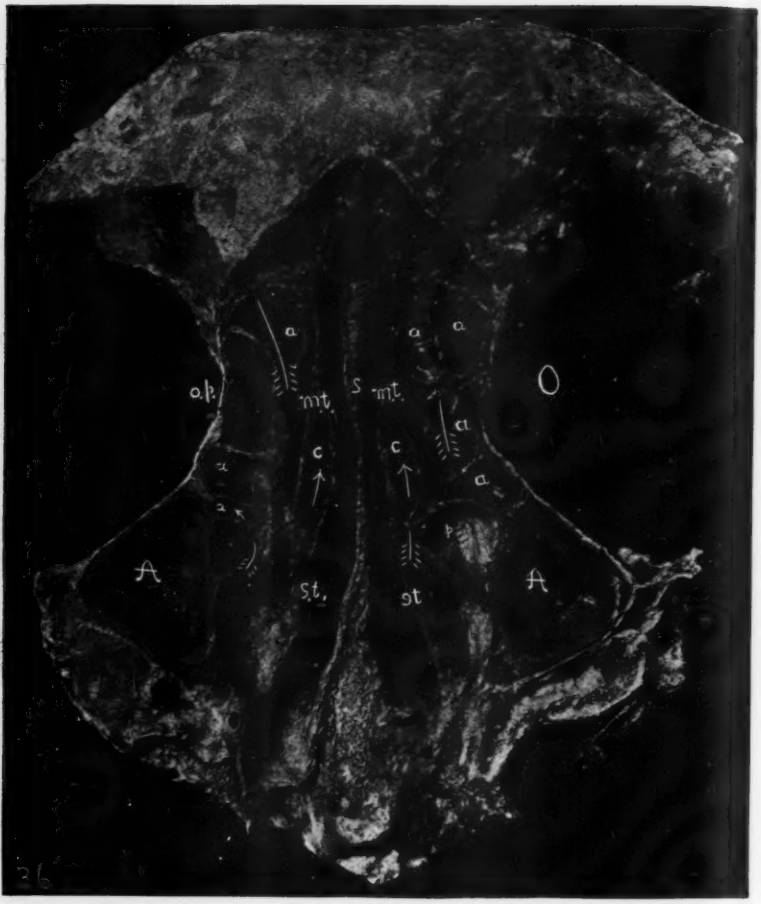

Fig. 36.—Horizontal section; upper half of specimen shown in Fig. 35. A, superior wall of antrum; **O,** orbital fossa; **s,** septum nasi, dividing the general nasal fossae shown as long, dark areas; **o.p.,** os planum of ethmoid; **a, a,** anterior ethmoid cells; **p.** posterior ethmoid cell. Two arrows are seen running forward into the frontal sinuses. **s.t.,** superior turbinates showing their under surface, which bounds above the recess called fissura ethmoidalis inferior; **m.t.,** the anterior vertical half of the middle turbinates containing the upper half of a cell. Arrows show these cells opening into the inferior ethmoidal fissure.

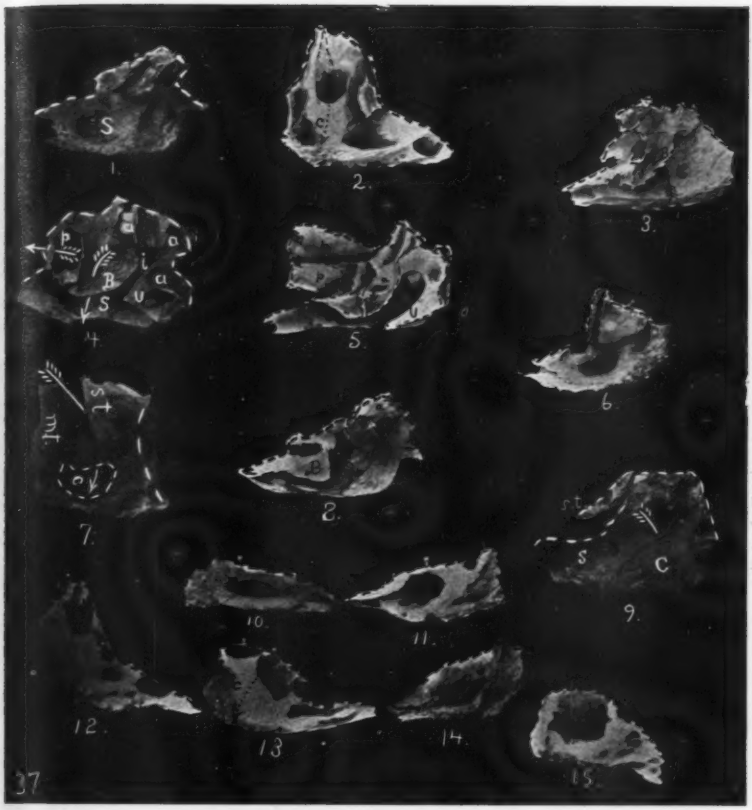

Fig. 37.—Lateral views of bony middle turbinate bodies removed along their line of attachment (dotted line) to the general mass of the ethmoid bone. **S,** sinus turbinalis, which is always on external surface; **a,** anterior and, **p,** posterior ethmoid cells; **c,** cell in the turbinate; dotted lines mark the cavities of ethmoid cells.

1. External surface of a right turbinate.
2. External surface of a left turbinate; arrow enters the ostium of a cell which opens into the middle meatus.
3. External surface of right turbinate; arrow enters the ostium of the ethmoid bulla (**B**).
4. External surface of right turbinate; arrow passes through the ostium of the ethmoid bulla (**B**) into middle meatus. **i,** infundibulum; **U,** uncinate process.
5. External surface of right turbinate. **B,** bulla with arrow through its ostium; **U,** uncinate process.
6. External surface of right turbinate. Operculum contains a cell, behind which is a deep sinus turbinalis.
7. Internal surface of left turbinate; arrow passes through inferior ethmoid fissure into a large cell (**c**), the wall of which has been partly removed; **s.t.,** superior and **m.t.,** middle turbinate bones. Cell measures sixteen millimetres long, twenty millimetres high, and eight millimetres wide.
8. External surface of right turbinate showing bulla and sinus.
9. External surface of right turbinate, which contains a very large cell with thin walls; it occluded the fossa; arrow shows its ostium; cell measures thirty millimetres long, twenty-two millimetres high, and eleven millimetres wide.
10. External surface of left turbinate showing a normal sinus.
11. External surface of right turbinate with a small cell anteriorly and a comparatively deep sinus.
12. Left turbinate external surface. Whole anterior half contains a large cell, into which an arrow is directed. It opens into the middle meatus. It measures sixteen millimetres long, twenty-two millimetres high, and twelve millimetres wide.
13. External surface of a middle turbinate, which contains a large cell occupying the anterior two-thirds of the turbinate. It measures eighteen millimetres long, sixteen millimetres high, and eight millimetres wide.
14. Outer wall of a right turbinate with a normal sinus.
15. Outer wall of a left turbinate which contains a deep sinus.

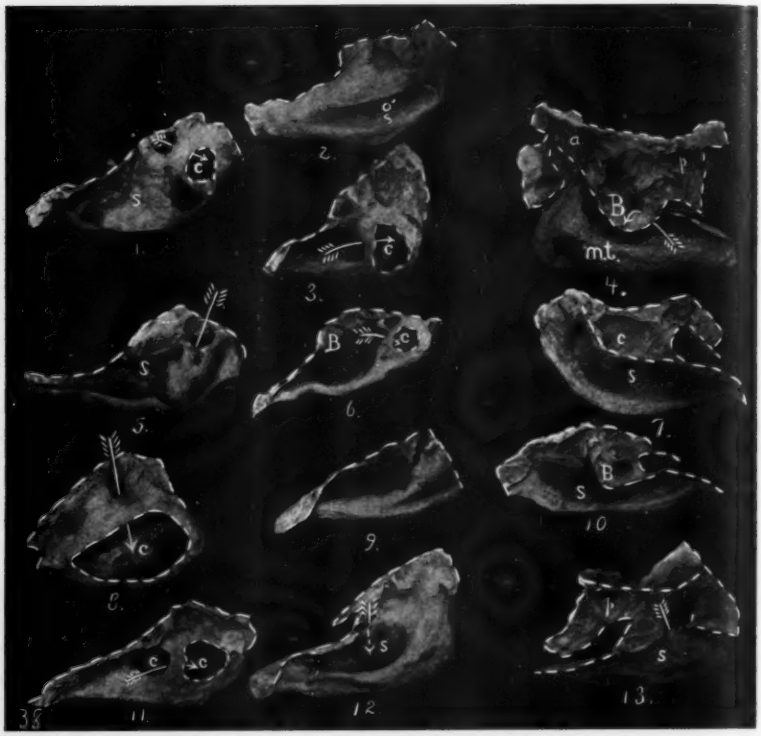

Fig. 38.—Lateral view of middle turbinates still covered with mucous membrane. A dotted line along the upper border shows the line of attachment to the lateral mass of the ethmoid bone. The cavity of cells (c) has been exposed by removing a portion of the lateral wall. s, sinus turbinalis. Portions of the superior turbinate appear in Nos. 4, 7, 10 and 13.

1. External wall of right turbinate; arrow passes into a cell through its ostium from the middle meatus.

2. Internal surface of left turbinate marked by a deep groove (g).

3. External surface of right turbinate; arrow passes through a large ostium into a cell which occupies the anterior half of the turbinate.

4. External wall of left turbinate. a and p represent the broken ethmoid cells; B, ethmoid bulla, with arrow entering the cavity through its ostium.

5. External wall of right turbinate showing a cell which occupies the anterior half of the turbinate opening into the middle meatus.

6. External wall of right turbinate which contains a cell occupying the anterior third of the turbinate.

7. External wall of left turbinate, the middle third of which contains a cell.

8. External wall of right turbinate containing a cell which occupies the greater part of the turbinate. It opens into the middle meatus It measures twenty-nine millimetres long, nineteen millimetres high, and ten millimetres wide.

9. Internal wall of left turbinate.

10. External wall of left turbinate. B, bulla.

11. External wall of right turbinate containing a cell in anterior third. The c to the left is at the ostium of the cell.

12. External wall of right turbinate. The arrow shows a cell placed vertically in the middle third of the turbinate. The turbinate sinus is deep.

13. External wall of right turbinate; arrow enters a large cell in anterior half of turbinate.

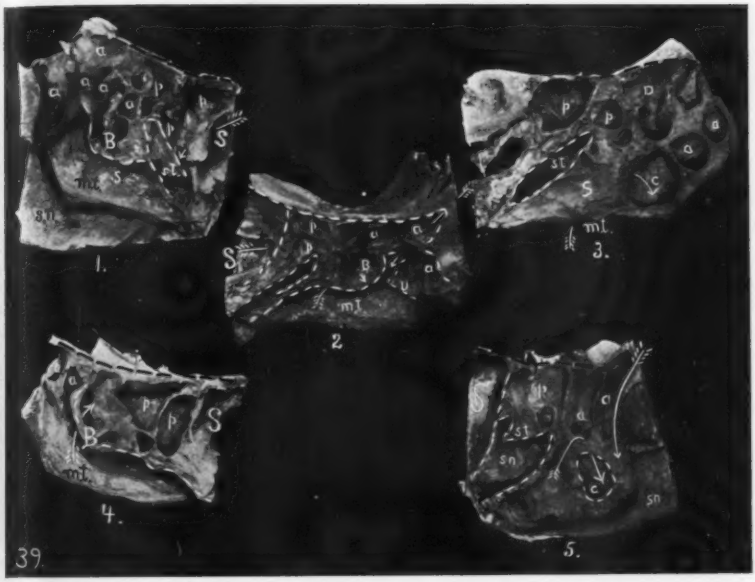

Fig. 39.—A series of middle turbinates removed by a vertical section through ethmoid cells, showing broken cells and the external surface of the turbinate. **a,** and **p,** anterior and posterior ethmoid cells; **m.t.,** middle turbinate; **s.t.,** superior turbinate.

1. **S,** anterior wall of sphenoidal sinus with arrow passing into spheno-ethmoidal recess through the ostium sphenoidale; **s.t.,** superior turbinate; **m.t.,** middle turbinate; **s.n.,** septum nasi; **B,** bulla.

2. **S,** sphenoidal sinus with arrow through its ostium; **B,** bulla with arrow entering its cavity from the middle meatus; **U,** uncinate process broken off. To the right is an arrow which leads from the frontal sinus, showing that the sinus communicates directly with the turbinate fossa.

3. The section passes vertically through a cell in the turbinate, into which an arrow passes from the inferior ethmoid fissure.

4. Free margin of the turbinate is thick. **B,** bulla with its cavity subdivided by bony partitions.

5. **S,** sphenoidal sinus; **s.n.,** septum nasi. A large cell occupies the anterior half of the turbinate opening into the middle meatus. Its ostium is at the apex of the cell. An arrow shows the communication with the frontal sinus.

Fig. 40.—Internal surfaces of a series of middle turbinate bones; dotted line marks the roof of nasal fossa. S, sphenoidal sinus with arrow through ostium sphenoidale; m.t., middle turbinate; s.t., superior turbinate; f.e.i., fissura ethmoidalis inferior; e.g., crista galli.

1. Average turbinate.

2. Small turbinate with anterior and inferior borders forming a very obtuse angle. U, uncinate process, behind which an arrow passes into the antrum through the ostium maxillare.

3. Average turbinate. 1 and 2, two superior turbinate bodies, between which is an ethmoidal fissure.

4. Small turbinate, on the wall of which is a large, deep groove. 1 and 2, two superior turbinate bodies.

5. Average turbinate. 1 and 2, two superior turbinate bodies.

6. Average turbinate with a short groove (g).

Fig. 41.—Internal surface of a series of middle turbinate bones; dotted line marks the roof of nasal fossa. **S**, sphenoidal sinus, with arrow through ostium; **m.t.**, middle turbinate; **s.t.**, superior turbinate; 1 and 2, two superior turbinates; **f.e.i.**, fissura ethmoidalis inferior.

1. Notch on lower border of turbinate; deep middle ethmoid fissure showing ostium of a posterior ethmoid cell. **U**, uncinate process, behind which an arrow passes to antrum.
2. Average turbinate; arrow passes through a large posterior ethmoid cell.
3. Borders of turbinate make an acute angle forming a well-marked operculum.
4. Groove (**g**) on internal surface of an average turbinate.
5. Borders of turbinate form an obtuse angle; long deep groove on turbinate; lower and middle ethmoid fissures well marked.
6. Average specimen. **s.t.**, well-marked cell in a superior turbinate.

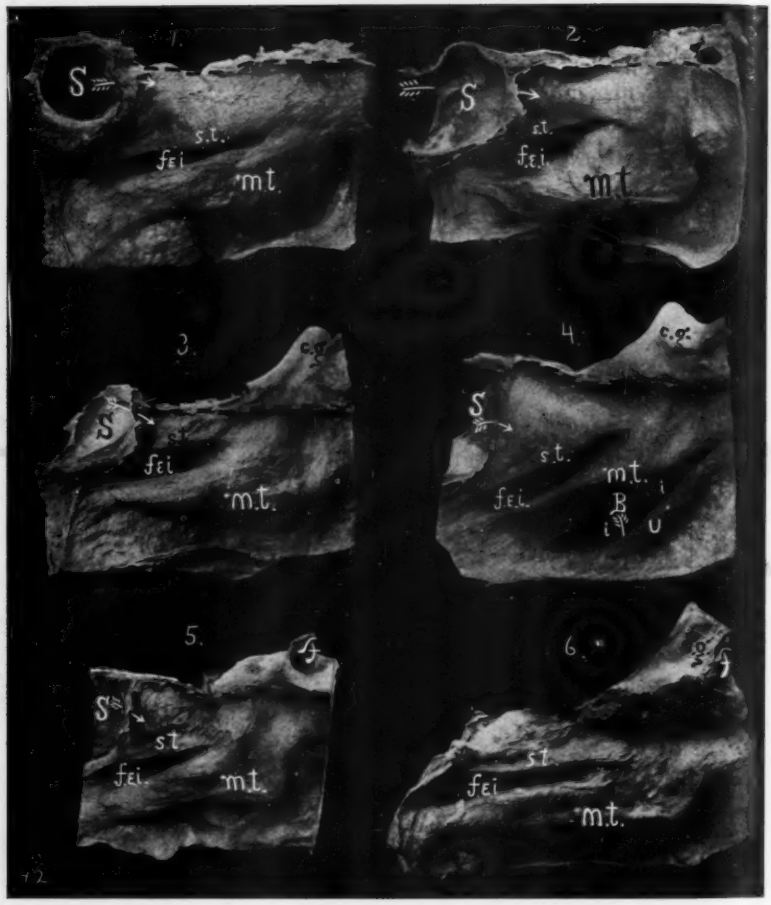

Fig. 42.—Internal surface of a series of left turbinates; dotted line marks roof of nasal fossa. **S,** sphenoidal sinus, with arrow through its ostium; **s.t.,** superior turbinate; **m.t.,** middle turbinate; **f.e.i.,** fissura ethmoidalis inferior; **F,** frontal sinus; **c.g.,** crista galli.

1. Small turbinate with obtuse angle.
2. Average specimen.
3. Small turbinate.
4. Turbinate much atrophied; it should cover the structures below it. **B,** bulla ethmoidalis; **I,** infundibulum; **U,** uncinate process, with arrow passing behind into the antrum.
5. Average specimen.
6. A long narrow turbinate.

Fig. 43.—Internal surface of a series of turbinates; dotted line marks roof of fossa. **S**, sphenoidal sinus, with arrow through its ostium; **s.t.**, superior turbinate; **m.t.**, middle turbinate; **f.e.i.**, inferior ethmoidal fissure; **F**, frontal sinus; **c.g.**, crista galli.

1. Turbinate presents a deep groove (**g**).
2. Prominent operculum. 1 and 2, two superior turbinates, between which an arrow emerges through an ostium of a posterior ethhmoid cell into the middle turbinate fissure; **a.o.m.**, accessory ostium maxillare
3. Small turbinate. Two superior turbinates. **a.o.m.**, accessory ostium maxillare; **U**, uncinate process, with arrow passing into the antrum through the usual ostium maxillare.
4. Borders of turbinate meet at a very obtuse angle. **c.g.**, crista galli; **c**, prominent posterior cell in the superior turbinate called the "tuberculum ethmoidale posticum."
5. Long, narrow turbinate with deep groove (**g**). Two superior turbinates with inferior ethmoid fissure carried well forward.
6. Borders of turbinate form a right angle. Two superior turbinates.

Fig. 44.—Internal surface of a series of middle left turbinates; dotted line marks roof of nasal fossa. **S**, sphenoidal sinus, with arrow locating ostium; **e.g.**, crista galli; 1 and 2, two superior turbinates; **m.t.**, middle turbinates; **f.e.i.**, inferior ethmoid fissure.

1. Sharp operculum.
2. Lower border of turbinate irregular.
3. Turbinate very much atrophied. Two ethmoid fissures very deep. **U**, uncinate process prominent, behind which arrow passes to antrum.
4. Average turbinate with short groove (**g**). **U**, uncinate process; **a.o.m.**, accessory ostium maxillare. Anterior extremity of turbinate incised as for its removal and exposure of structures external.
5. Normal and very regular turbinate. **e**, cell at extremity of ethmoid fissure forming a "tuberculum ethmoidale anticum." Two superior turbinates.
6. Long narrow turbinate; both ethmoid fissures show ostia of posterior ethmoid cells. **U**, uncinate process, with arrow leading to antrum.

Fig. 45.—Internal surface of a series of turbinate bones which contain a cell (**c**). The internal wall of the cell has been partly removed, as shown by a dotted line. The horizontal line marks the roof of fossa. **c.g.,** crista galli; **s.t.,** superior turbinate; **m.t.,** middle turbinate; **f.e.i,** interior ethmoidal fissure; **S,** sphenoidal sinus with arrow through its ostium

1. **c,** cell, into which an arrow passes through a wide ostium from the middle meatus; **U,** uncinate process; **B,** bulla ethmoidalis; arrow passes between bulla and uncinate process to antrum. A long arrow passes from the frontal sinus to the middle meatus.

2. A large bullous cell, with arrow from middle meatus occupying the anterior half of turbinate. It measures twenty-three millimetres long, twenty-six millimetres high, and twelve millimetres wide. A posterior ethmoid cell (**p**) opens into the ethmoid fissure as indicated by arrow.

3. Small cell opening into the ethmoid fissure.

4. A large cell in the anterior third of turbinate, which communicates with middle meatus by a long semilunar ostium (arrow) and extends above it into an anterior ethmoid cell. **a.o.m.,** accessory ostium maxillare; 1 and 2, two superior turbinates. Turbinate cell measures fifteen millimetres long, twenty millimtres high, and nine millimetres wide.

5. A turbinate containing two distinct cells; the anterior one communicates with the middle meatus, the posterior with the ethmoid fissure, as shown by arrows.

6. A very large cell which is continuous with posterior ethmoid cell and opens into ethmoid fissure. **a.o.m.,** accessory ostium maxillare. It measures twenty-two millimetres long, thirty millimetres high, and nine millimetres wide.

Fig. 46.—Internal surface of a series of right middle turbinates which contain cells; internal wall partly removed, as shown by a dotted line; horizontal line marks roof of fossa; arrows enter the cells (**c**) through the ostium. **S**, sphenoidal sinus with ostium; **s.t.**, superior turbinate; **m.t.**, middle turbinate; **f.e.i.**, inferior ethmoid fissure; **a** and **p**, anterior and posterior ethmoid cells.

1. Cell is continuous with a large anterior ethmoid cell which extends to cribriform plate. An oval ostium communicates with middle meatus.
2. A large cell communicates with an extensive posterior ethmoid cell, both of which have a single common ostium leading to the inferior ethmoid fissure.
3. The turbinate cell communicates with a posterior cell marked **a**, both of which open into the ethmoid fissure.
4. Large cell in anterior half of turbinate possessing a large oval ostium, through which the bulla (**B**) can be seen. 1 and 2, two superior turbinates.
5. Large cell which communicates with a large anterior cell extending to the cribriform plate. Through the large crescentic ostium can be seen the bulla. Cell measures twenty-two millimetres long, thirty millimetres high, and nine millimetres wide.
6. Cell opening into the middle meatus.

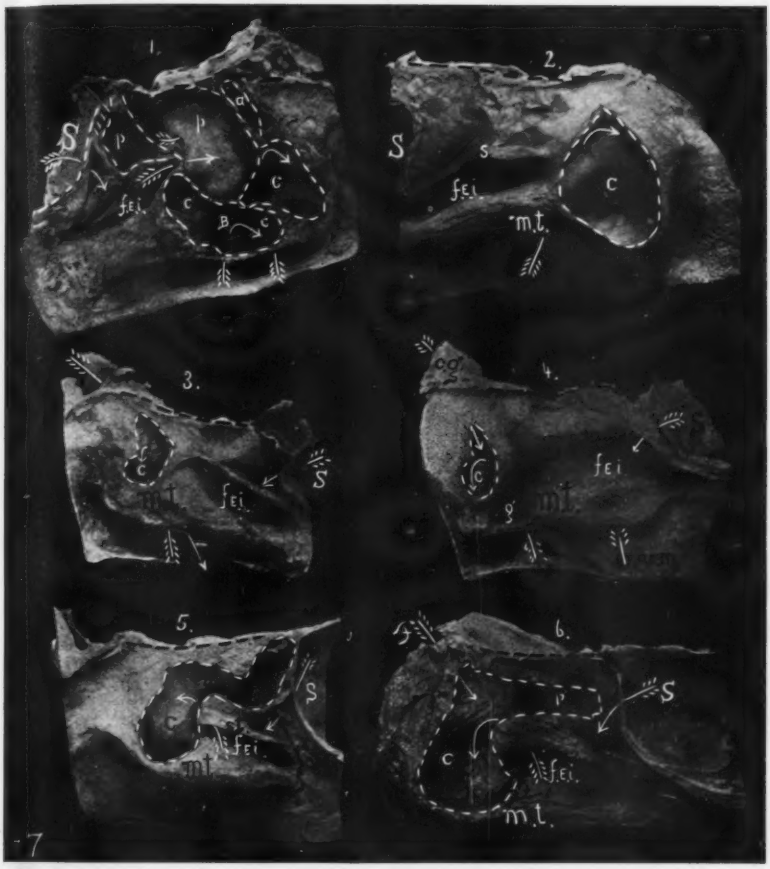

Fig. 47.—Internal surface of a series of turbinates which contain a cell (**c**), the wall of which has been removed and marked with a dotted line. Horizontal line corresponds to roof of nasal fossa. **S**, sphenoidal sinus, with arrow indicating ostium; **s.t.**, superior turbinate; **m.t.**, middle turbinate; **f.e.i.**, fissura ethmoidalis inferior; **a**, and **p**, anterior and posterior ethmoid cells.

1. Section passes through two cells in the turbinate and also some ethmoid cells; both turbinate cells open into the middle meatus.
2. Large cell measuring eighteen millimetres long, twenty-one millimetres high, and ten millimetres wide.
3. Small cell in upper portion of turbinate.
4. Small cell opening into middle meatus; posteriorly is a short, deep groove. An arrow passes from frontal sinus to the turbinate fossa; an arrow enters the antrum through the accessory ostium.
5. A large cell continuous with a posterior cell, both of which open into the ethmoid fissure by a common ostium. It measures twenty-two millimetres long, thirty-two millimetres high, and ten millimetres wide.
6. A large cell similar to 5, measuring thirty-three millimetres long, twenty-one millimetres high, and eleven millimetres wide.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY.

PROCEEDINGS OF THE TENTH ANNUAL MEETING, HELD IN CHICAGO, MAY 30, 31, AND JUNE 1, 1904.

The society met at the Auditorium Hotel, under presidency of Dr. Norval H. Pierce, of Chicago.

An address of welcome was delivered by Dr. Frank Billings, of Chicago, on behalf of the local medical profession, after which the President delivered his address.

President's Address.

President Pierce pointed out the great changes that had been wrought in the special domain of laryngology, rhinology and otology during the life of the society. Ten years ago it was hardly more than a matter of sprays and spurs, of snares and syringes. The members no longer confined themselves to intra-laryngeal, intra-nasal and intra-cranial operations, but by most radical external surgical procedures it was the aim to cure the most extensive diseases of the nose and accessory sinuses, the larynx, the pharynx, the ear, and neighboring parts within the cranial cavity. This change had taken place gradually. It took years of endeavor to set the bounds of laryngoscopy, rhinoscopy, and otoscopy. Lately, by the work of Killian, Jansen, and of many of the Fellows, the advance had been made more rapidly, so that at the present time the well-rounded and successful specialist must not only possess that special skill and dexterity which enabled him to examine successfully the larynx, the nose, with the orifices of the several accessory sinuses, the ear, both by otoscopy and by means of complex functional tests, but he must combine with this a broad surgical knowledge equal to that of the general surgeon, and an ever-accessible knowledge of regional anatomy superior thereto. Thus did they prove the right to exist as specialists and members of the surgical department of the great science and art of medicine; but he expressed the fear that the pendulum might swing too far in the direction toward radicalism. With the technique of external operations firmly within grasp, were not the members liable to resort to them permaturely—to

forget that much might be done by more conservative local measures, etc.?

Report of Meeting of Middle Section.

Dr. Chevalier Jackson said it was the custom for the chairman of sections to make a report each year, and then recommend the abolition of the sections. A wet blanket was put on sectional work in the shape of a resolution presented at the last meeting of the society, and which, he understood, was to be voted on at this meeting, relative to discontinuing the work of sections. In spite of this. he said they had a good meeting. There were about thirty members present. There were fourteen papers by some of the best men in the society, and this meant some of the best men in this or any other country. The meeting began at 10 o'clock in the morning, and the scientific program was finished by 5 o'clock in the evening. He heartily favored continuing the sections.

Exhibition of Mastoid Case.

Dr. William L. Ballenger presented a case in which there had been, after a secondary operation, Thiersch skin grafting in the mastoid wound. The surface was now almost completely healed except at the site of the orifice of the Eustachian tube. This was rapidly closing up, and he had no doubt that in a week's time it would be closed completely.

Some time ago he had another case similar to this in which the wound had been completely covered and the Eustachian tube closed. In this case he resorted to skin grafting in the mastoid wound, as in the previous case.

Exhibition of Specimens.

Dr. George L. Richards exhibited some specimens, and said a word or two as to the relation of the dentist to maxillary antrum trouble. The first specimen was a *tooth which set up antral disease*, the result of a capped tooth. He had seen it stated in some publications that dentists had been held responsible for setting up antral trouble by capping teeth that ought to have been treated otherwise.

He showed two interesting specimens of *foreign bodies removed from the nose*. One was a pants' button which a patient was said to have carried in his nose for seventeen years instead of on his pants. Another patient, said to have catarrh, had

his catarrh cured by the removal of a cherry stone from his nose.

He showed a very large *adenoid* removed from a child, six years of age. The operation was done under ether anesthesia, the anesthetic having been given by a nurse. Just as the child was apparently under complete anesthesia, there was a spasmodic closure of the jaw, and immediately the child was asphyxiated. He had to resort to artificial respiration, hypodermic injections, forcing open the jaw, and traction of the tongue, otherwise he would have had a dead child. The adenoid was very large, completely occluding the naso-pharynx, and when closure of the jaw occurred at the last moment of etherization, no air entered, and consequently the child was asphyxiated. The child's breathing could hardly be noticed by the anesthetist. A trained etherizer would have noticed it. Many times ether had been given by a nurse to his patients, and yet nothing had happened worth mentioning. In etherizing a child with adenoids, one should closely watch the mouth and see that respiration was not interfered with.

The last specimen was an *arrow bougie,* which was used in the early stages of acute earache. There had been a good deal of trouble to get these bougies properly made, but the urethral bougie maker, Dr. Mitchell, of Philadelphia, had made them and put them up in nice shape. He passed them around. They could be washed off with warm water, dusted with lycopodium powder, and one could slip one into the ear of any child. One practitioner told him that he had used the bougie in a case without effort. He examined the child and found one-quarter of an inch of wax between the bougie and drum. The reason why the practitioner failed was evident. If the canal was patent in the early stage these bougies would do some good. They did not necessarily prevent incision of the drum, or anything of that kind.

Sarcoma of the Nose.

Dr. Wm. L. Ballenger said a young lady came to his clinic some months ago with a broad nose, and with a history of some pain and complete occlusion on both sides. He removed nearly the whole of the right inferior turbinated body, submitted it to a pathologist for examination, and received a report that the process was tubercular. This report, however, was not satisfactory to him. He removed some more tissue, submitted it for examination, and received a report that it was granulation

tissue. He felt the case was one of sarcoma and decided to operate without any satisfactory miscroscopic diagnosis. He operated seven weeks ago by the radical method, as in his opinion, if he had operated by the intra-nasal method, the occlusion would recur inside of a week. With the Roe saw, after making incisions on the side of the nose, he went through the maxillary bone, turned the nose down over the mouth, and through this route he was enabled to remove a large amount of necrotic and mole-looking tissue from the nose on the right side. He found the bone completely necrosed, and he could pass his finger readily through the opening before using the saw. With the curette and other instruments, such as a biting forceps, he succeeded in removing almost all the turbinated tissue from both sides of the nose, and thus far there was no recurrence of the growth. After submitting specimens of the growth to a pathologist, he received a report that the disease was sarcoma. By operating in this manner he was enabled to remove more deeply seated tissue and thus get a correct report of the pathology of the growth.

This case illustrated the futility of relying absolutely upon microscopic reports in these cases, because in this case the microscopist, without knowing what it was, gave three defferent reports. First, he said it was a tubercular process. second, granulation tissue and, third, sarcoma of the nose. Whether tuberculosis was present or not, he could not say. The case did not impress him clinically as one of tuberculosis, but as one of sarcoma.

Dr. Wendell C. Phillips asked if syphilis was excluded in this case.

Dr. Ballenger replied, yes. He could get no history of specific infection or any suspicion of it.

Tonsillotomy Forceps.

Dr. H. Holbrook Curtis showed a set of tonsillotomy forceps which in his hands had proved to be very successful. The instrument was made by Matthieu, of Paris. The advantage of the instrument was that, in cases of children who had diseased tonsils, so small, however, that it was impossible to use a tonsillotome, the tonsil could be removed readily in one's office without an anesthetic. It was remarkable with what facility one could get at the tonsil and remove it. He had done a great many operations with this instrument. In a flat indurated tonsil very often while operating one found two or

three drops of pus which explained the recurrent tonsilitis met with in these cases.

The other instrument was a modification of the fenestrated forceps figured in Bosworth's work. He had adapted it to the conformation of the posterior wall of the pharynx. With a forceps with an obtuse angle, one was apt to avoid a portion of tissue at the base of the vomer, but with a forceps at right angles, or five degrees less than the right angles, this little mass of tissue was entirely removed. It was this bit of adenoid tissue which furnished a starting-point for the recurrence of adenoid vegetations.

A New Mastoid Gouge.

Dr. Wm. Sohier Bryant showed the adaptation of a tool which was used for wood carving. It had been found quite convenient in carving the mastoid process, and in cranial surgery, etc. It could be used like a lever, and with it one could work with great accuracy, and a mallet was no longer necessary.

New Head Lamp.

Dr. Chevalier Jackson said some kind of light was necessary for all our work, but when a patient was under anesthesia the usual mirror was not satisfactory, for every time the position of the source of light or of the operator's hand changed, the mirror had to be changed. How some operators could get along without some kind of head-light at this, groping around in the dark as they did, and yet do the good work they undoubtedly did, he did not know. He did not know how they could tell normal from pathological tissue. One could tell diseased bone by the feel of the curette, but with the soft tissues he could not do this. For several years Dr. Day and the speaker had been using a lamp which he had devised for operating under anesthesia. It was a thirty-two candle power lamp, cheap, and could be bought for any current. It was frosted a little at the top in order to lessen the glare in the assistant's eyes. A little shield went back of it, which reflected the light forward and kept it out of the operator's eyes. It illuminated the whole field of operation, and gave plenty of light. It got hot enough to be sterile in its exposed part, but not enough to cause discomfort. The ordinary sterilized muslin operator's cap was worn over it, only the lamp and reflector projecting.

Tracheal Canula.

Dr. Ewing W. Day and the speaker had had about eight cases of post typhoid fever perichondritis of the larynx, followed by stenosis, six of them requiring tracheotomy. In some cases, when the abandonment of the tracheal canula was attempted, the patient did not get air through the larynx, owing to cicatricial stenosis; consequently they performed thyrotomy, retracted the thyroid cartilage, eviscerated the larynx, clipping out all cicatricial tissue. To keep the larynx open, they devised a T-shaped tracheal canula, one portion of which went up, and another down. One portion went up into the larynx and kept the lumen of the larynx open until most of the danger from cicatricial contraction was over. Healing of the tracheotomy wound occurred around this, so that a T-shaped tube could not be introduced, and to overcome this they cut it apart in two sections. One piece was slipped downward into the trachea, the other upward into the larynx, and the two locked together by a collar slipping over them. Outside a tape holder kept the dressing in place. The trachea could be measured through the tracheotomy wound before the thyrotomy, and the instrument could be selected to fit it. When in position the epiglottis came down and covered the top of the canula, the entire larynx being filled with the upper part of the canula. After the larynx was completely healed and its lumen lined with epithelium, one of these large intubation tubes was put in, in the usual way, through the mouth, the T canula abandoned, and the tracheotomy wound allowed to close.

Dr. George L. Richards suggested a modification of Dr Jackson's instrument. It seemed to him it would be a very inconvenient thing to keep on one's head. It was always wobbling, first one way and then the other. He was using a device which could be adapted to this lamp, and it could be obtained from most opticians. It was a perforated hard rubber ring which sets perfectly over the head, and could not be knocked off. One could adapt the same thing to this lamp with perfect ease. The one he used was made by Wall and Ochs, Philadelphia.

Dr. Chevalier Jackson said in regard to the modification suggested by Dr. Richards, that after the laryngeal lumen had been covered with epithelium, one of the large intubation tubes was slipped in and the tracheotomy wound allowed to close. If this were put in immediately after operation, the post-operative

swelling and edema would render it dangerous if it should be coughed out. If the intubation tube should be coughed out, the edema and swelling, attended with a certain degree of paralysis, would cause an immediate stenosis, and would probably kill the patient. Many patients had died in that way. Their method had been to allow the larynx to heal completely and regain an epithelial covering. They kept the tube in two or three months. At the end of that time some of the patients would let them take it out, while others would not. They realized the trouble incidental to cyanosis, and therefore, they were much adverse to having the tube taken out. If the tube was taken out say once a month, then there was very little or no danger of stenosis. The tube should be taken out at least once a month, because otherwise concretions would form on it.

He did not offer it as an improvement on the O'Dwyer tube. There could be no improvement for the purpose for which the O'Dwyer tube was used. This tube, with wedged-shaped point put in a diphtheritic larynx, might result in traumatism, which was a bad thing in cases of diphtheria. But here the conditions were entirely different. Furthermore, one had the eviscerated larynx to deal with, requiring a large tube with a large interarytenoid swell and large retaining swell.

Dr. Edward B. Dench stated that while the device exhibited by Dr. Jackson seemed admirable, still the criticism would obtain that one could not control the electric wire either in hospitals or in offices. He asked Dr. Jackson if the lamp had ever exploded. He asked the question because shortly after Dr. Jackson demonstrated it at the last meeting there were two accidents, one in his own hands, and the other in the hands of Dr. Delavan, of New York. The current was too strong, and the lamp exploded, doubtless due to imperfect wiring. If there was any likelihood of the lamp exploding on the operator's forehead, of course, it was dangerous for the patient as well as for the operator. Perhaps this would not happen, if there was a good, strong safety fuse, and the possibility of the lamp exploding and doing considerable damage would be small.

Dr. Wendell C. Phillips referred to the accident which Dr. Delavan had experienced, which might have been serious, and considered the lamp which Dr. Jackson showed at the last annual meeting, in order to prevent any such possible accidents from occurring, needed some marked improvement in the way of safety.

Dr. J. A. Stucky stated that those who had not used this

lamp, after having used it, would never be without it. It was as perfect as could be for mastoid work, or any operation where one had a large field and wanted plenty of light. He suggested one improvement, that is, covering the wire over the metallic edge of the band with rubber tubing. This would prevent the danger of imperfectly insulated wire getting wet with perspiration and creating a short circuit.

Regarding the objection mentioned by Dr. Richards about the head band not fitting, he had never found that trouble.

The thing that commended the lamp especially was the brilliancy of the light, simplicity, and its general adaptability. One could adapt it to any socket in the house or any hospital. A rheostat was not needed. He regarded it as one of the best instruments to have in that line.

Dr. George L. Richards said, with regard to the thirty-two candle power lamp and rheostats made, one would find the small lamp which he exhibited at two of the meetings of the eastern section very useful. He though it was an improvement on the lamp of Dr. Jackson. It had a mirror, so that it reflected light, and one could use it with a good sized small lamp and get as brilliant a light as he could with this one.

Dr. Edward B. Dench was very much interested in this subject, and hoped Dr. Jackson would not take his remarks in a spirit of criticism. This was a perfectly helpful piece of apparatus. He wanted it, however, free from danger.

As to the lamp described by Dr. Richards, with portable rheostat, he would say that in almost every instance where it had been operated in any regular hospital, something had gone wrong with the rheostat. He had used the instrument for a great many operations in hospital practice and had had no trouble, but if one put it in a strange plug something happened. He did not know what it was. When he was going to do operations in private houses he thought Dr. Jackson's lamp would be a great aid to him.

Dr. Norval H. Pierce had had three of Jackson's lamps for transillumination. One of them burned out in his own mouth; the other was broken accidentally, while a third exploded before it had been used. He had just screwed it into the socket, when there was a violent crash of glass, and everything was consumed. He screwed the lamp into the socket while the current was turned on.

He did not mention these accidents to throw cold water on the use of the lamp because he had been very much pleased with

it and had recommended it. However, there was undoubtedly more or less danger attending its use, and it would be a very inconvenient, not to say dangerous, thing to have such an occurrence take place with a nervous woman.

Dr. Chevalier Jackson said he had already consumed too much time in speaking on this subject, but at the risk of being tedious he desired to say a word or two more in regard to the head-lamp. It was an entirely different thing from the transilluminating lamp. Dr. Delavan wrote him regarding his experience with the transilluminating lamp immediately after it had exploded. He wrote the manufacturers of the lamps, and they said that of all the lamps they had sent out, this was the only one they had heard of as having exploded. When these lamps came into use for general commercial purposes, and were manufactured cheaply, some of the lamps turned out were defective, and the Delavan lamp might have been one of that class. That these lamps could be made safe was claimed by the manufacturers. If his experience had been that of Dr. Pierce, or that of Dr. Delavan, he would not touch the thing, however, he had used the same original six lamps for several years and had not had any accidents or explosions, and he would continue to use them for that reason. He had no doubt that some defective lamps had been sent out, but what the defect was or had been he did not know. This, however, had nothing to do with the large head-lamp shown to-day. It could not explode.

Office Appliances.

Dr. Wendell C. Phillips exhibited and described several office appliances.

Dr. Chevalier Jackson presented the following report, and exhibited a specimen for Dr. John S. Mabon, of Allegheny, Pa.

Report of a Case of Tonsillolith and Exhibition of Specimen.

The principal point of interest in this case was the exhibition of the specimen, as unfortunately the author did not see the patient until after the tonsillolith had been expelled.

Mr. S., aged about 55 years, came into his office and stated that he had not called upon professional business, but on a matter of scientific interest. For several months he had been troubled with a cough, especially in the mornings. At times it was so severe that it would produce emesis. On this par-

ticular morning it was so pronounced that he resolved to consult a physician. On his way to the doctor's office the man had an attack of coughing, during which he expectorated the tonsillolith. Dr. Mabon was rather incredulous, and asked the man if he had expectorated it on the sidewalk, from which he recovered it. The man replied, rather heatedly, "I didn't imagine that it came from my throat, because I took it out from my mouth."

On examination, the only abnormal condition apparent was a peculiar glairy appearence of the edge of the posterior half-arch on the right side. On introducing his finger Dr. Mabon found a cavity between the half-arches fully large enough to accommodate the specimen. There was no hemorrhage following the expulsion of the tonsillolith, nor was there any denuded point on the membrane. It was the intention to have a section made of the specimen, and an analysis of the filings, in order to show the strata formation and its composition, but the chemist advised against it, fearing destruction of its contour.

The weight of the specimen was 147 grains. Mr. S. told him that about ten years ago he expectorated a stone in the same manner, which was about the size of a split pea.

Dr. Robert C. Myles said that not long since he had a patient whom he tried to cure by a radical operation by removing the floors of both frontal sinuses, and in one of the sinuses he found that secretion took place behind the orbit, and being desperate in regard to effecting a cure, he followed the floor of the frontal sinus beyond the eye so far that he got into the post-orbital space, and as a consequence he had a post-orbital abscess from infection. He did not see how he could have avoided it, and how he could have obliterated that part of the sinus unless he removed these floors. The man recovered with good eye-sight. A large quantity of pus escaped through an inch and a half incision, which was made. There was some inflammation of the retina, so that the case looked serious for a while. Patient had double vision, but this was relieved. In the future he would not go so far back; he would rather trust to better drainage into the nose. The unfortunate part of it was the stab behind the eye.

Some Points in the Pathology of "Bone Cysts" in the Accessory Sinuses of the Nose.

Dr. A. Logan Turner, of Edinburg, Scotland, read a paper

on this subject. For want of a better descriptive title, the author included under the term bone cysts those cases of cyst-like distension of the air sinuses which were from time to time met with and which must be regarded as a pathological condition distinct from the suppurative affections of the sinuses.

Distension of the walls of the ethmoidal cell labyrinth, of the frontal sinus, and of the antrum of Highmore had been described, but so far as he had been able to ascertain no similar condition of the sphenoidal sinus had been met with. The condition was the same in its clinical course and in its origin whichever cavity it effected.

An analysis of the various published cases illustrating this condition revealed the interesting fact that in some the bony cavity merely contained air; in others the contents were of a mucoid character, while in a third group of cases pus or muco-pus was found.

Perusal of the literature dealing with cyst-like distension of the middle turbinal, so far as the author was able to gain access to it, furnished him with the report of 46 cases, although a number of other instances had undoubtedly been met with. Of the 46 cases, 26 occurred in women and seven in men, the sex in the remaining thirteen cases not being stated. The female sex, therefore, showed a considerable preponderance. In fourteen cases the right, and in sixteen the left middle turbinated bone was the seat of the affection, while in five the condition was bilateral. In fourteen no statement was made regarding the side of the nose affected. In 24 cases the age of the patient was stated. The youngest was 16, and the eldest 65 years of age. Three were below 20, and four above 40 years of age. The majority, therefore, were in middle life. The condition had not been observed in childhood.

In regard to the origin of a small number of these cases, there was evidence to show that the condition was not a strictly pathological one, but rather the result of an excessive anatomical development or overgrowth of the normally existing air space.

The chief symptoms complained of by a patient suffering from distension of the middle turbinated air cell were usually those of gradually increasing nasal obstruction, commonly unilateral, and pain varying in degree and in situation, sometimes of the nature of headache of a very severe type. Intranasal examination revealed a swelling of varying size present-

ing a smooth uniform surface, perhaps of a somewhat paler color than the normal mucosa.

The author had been able to analyze fifteen cases of this affection to which the term ethmoidal mucocele might be justly applied. Of these, eight occurred in males and six in females, the sex in not one being stated. The majority of the cases occurred during adolescence. Thus, of the fourteen in which the age was recorded, ten were met with between the age of twelve and twenty, three between twenty and thirty, and one was only 32 years of age. As regards the side of the nose affected, information on this point was to be found in eleven of the cases. In one the affection was bilateral; in ten, unilateral, the right side being affected in four and the left in six. In all, with two exceptions, the contents of the distended cavity were of a mucoid character, having a viscid tenacious consistence.

The author discussed at length distension of the air cells situated in the lateral mass of the ethmoid bone; the differential diagnosis; the maxillary antrum, etc.

Discussion:—Dr. D. Braden Kyle was asked to open the discussion. He said he had been very much interested in the views of Dr. Turner. The question of cysts, especially bone cysts, was important chiefly in regard to etiology, the classification of which he gave as follows: (1) Those that formed in a cavity already existing, such as retention cysts, due to the dilation of the follicles of the mucous membrane lining the cavity. (2) Those resulting from some pathological process in the tissues, a cystic degeneration following inflammatory processes.

About the nasal cavities, either in the turbinated bones or accessory cavities, we had cysts, as has been shown, nearly all of which cavities communicated with the surface. Personally, he believed he had seen quite a number of cysts of the turbinate involving the ethmoid cells, which were largely retention cysts.

A curious feature regarding cysts was that, as a rule, they formed in a locality of good blood supply, with the exception of those found in a bony cavity. Occasionally one found cysts forming in cartilaginous structures, but this was rare. With the exception of dermoids, he believed the original exciting cause of cysts was undoubtedly an inflammatory one. With the minute openings of the various cells of the turbinates and accessory cavities, it was readily understood why we could have beginning rentention cysts.

Dr. Frederick C. Cobb said he had had three or four cases of dentigerous cysts and had therefore been much interested in what Dr. Turner had said. There were two or three points in his paper which impressed him as being of the greatest interest. One was that a diagnosis between antral disease and cyst after puncture of a dentigerous cyst was comparatively easily made. If one first punctured the wall, he went through the thin shell of the bone cyst, and then through this wall, if a canula; then without removing the canula, if the trocar was pushed farther, fluid would come out through the nose, so that one could differentiate easily between antral disease and cysts.

It was an interesting thing to him to see whether these cysts subsided after simple puncture and the removal of the tooth. He took the trouble to trace his cases for a year or two, especially those which had simply an offending tooth removed, and he found to his surprise that in that interval the whole bony wall had subsided, so that the face was normal in appearance, whereas before the puncture the antrum seemed much larger, showing that operation on these cysts was certainly frequently unnecessary, and that cases did not require more than the removal of a tooth and puncture to effect a cure.

Dr. Robert Levy said, in addition to the symptoms enumerated by Dr. Turner, in the few cases of cysts of the middle turbinate he had seen, the most prominent symptoms had been reflex ones. In a number of instances there was pressure, inducing very pronounced neuralgic pain and sneezing. In one instance he felt he might attribute asthma, at any rate in part, to the pressure of a large middle turbinated cyst.

Dr. Robert C. Myles did not think that many of the members knew enough about the cause of bone cysts to discuss the subject intelligently. It was probable that from the earliest time these bone cysts had been associated with nose trouble. Attention had been called to cysts in the ethmoidal region by ophthalmologists, and, if possible, it would be interesting to know the probable cause of them before beginning treatment. The condition seen in these cases was evidently due to extension of the pathological process, and this extension must be ascribed to confinement. Whatever the incipient change might be which took place to start these cysts in their embryonic state, so to speak, it needed further consideration. For instance, he could not understand how a pyogenic condition could produce bone cysts in the sense of secretion of mucus. He could not

understand their purulency. It was thought that the secretions in passing through the membranes produced a pyogenic condition, and we had these cysts starting in the ethmoid region. Most of the members had undoubtedly seen cases in which there had been an extension of the pathological process from the sphenoid bone to the frontal, but which did not require any operation. These cases were easily cured by making a large opening from the cavity into the nose, inserting gauze and retaining it until the walls had become hardened.

Cysts of the antrum were moderately common, and the author's experience had been that the outer wall of the antrum became so thin that the finger could crush it in about the malar ridge, and one could easily penetrate this ridge for operative or other measures of treatment.

About two years ago he was called by a prominent physician to assist him in operating on a woman. He stated that the woman would not consent to have any one operate upon her except himself, but he wished Dr. Myles to be with him. The case was one of large cyst of the antrum. Some destructive changes had taken place in the wall of the cyst, and there was a purulent condition. Under his direction the surgeon made an incision about an inch and a half or an inch and a quarter in length, curetted the antrum thoroughly, and got a large opening. The woman made an uninterrupted recovery.

As to frontal sinus disease, the last case the author had was a woman 73 years of age, who had a cyst extending from the frontal sinus to the anterior ethmoidal sinus. In removing the anterior ethmoidal cell it was his intention to remove the anterior part of the frontal sinus, also to remove the anterior ethmoidal. The woman's heart failed under the anesthetic, and she was practically moribund.

He had made a promise that in event of serious trouble he would cease operating. He removed the anterior ethmoidal cells under cocain and made a complete opening from the front. At the end of three weeks the woman was perfectly well. How long the condition had existed he did not know.

Dr. Turner in closing the discussion, thanked the gentlemen for the very cordial way in which they had received his paper. There were many points he would like to discuss, but time did not permit him to do so.

With the secretary's permission, he would like to change the title of his paper from Etiology to Pathology, as he thought it would read better.

Dr. Lewis A. Coffin, of New York City, read a paper entitled

Report of Four Operative Cases of Sinusitis in Children.

with a presentation of specimens illustrating the development of the sinus.

He reported in detail the histories of four cases of sinus disease which he had met with in young children. He brought out the peculiar and somewhat obscure symptoms found in such cases, and dwelt particularly upon the question of the existence of a true inflammation of the antrum of Highmore in children, demonstrating from his carefully prepared specimens that the antrum of Highmore in the infant occupied an entirely different position relative to the orbit than in the adult, which rendered it anatomically almost incapable of being involved through trauma. By means of a most beautiful series of wet specimens and lantern slides he further dwelt upon the relation to one another of the various sinuses in the infant and their mode of development, showing that the frontal sinus is absent in earliest infancy, only begins to develop after the seventh or eighth year, and often does not attain its full development until puberty.

DISCUSSION: Dr. A. Logan Turner said he had listened with a great deal of pleasure to Dr. Coffin's valuable paper, and he congratulated him heartily on the specimens, which were of great value. He envied the opportunity he had of obtaining the material, because such material obtained at that age was all the more valuable.

The author of the paper raised the question of antral abscess in the infant and young children. Most of the members were doubtless familiar with Dr. Myles' paper on that subject, and also with reference to other papers by different authors upon antral suppuration in infants, ranging in age from three to six weeks old. The speaker always had difficulty in understanding how such a thing could be, and he had favored Dr. Coffin's side of the question along with Repke and others, and took issue with Dr. Myles. One had only to look at Dr. Coffin's specimens to see how difficult it was to realize that there could be such a thing as chronic antral abscess in infants and young children. He was in sympathy with Repke that the condition was probably an osteomyelitis of the superior maxilla, but whether it was of tuberculous origin or not, was a bone of some contention. Some cases were undoubtedly of tuberculous origin.

The question of the frontal sinus early in life was also interesting, and he still thought the various opinions that had been expressed were due to the views which men took in the commencement of its development. But there was so much variation in the sinuses, both in the adult and the infant, that he was not surprised at variations in the time of development.

He was interested in what Dr. Coffin had to say in reference to what he presumed was an old theory. He had seen it mentioned before, namely, the probable development of the sinuses from pneumatic pressure. This was new to him, and it was certainly a view which required thinking over.

With regard to the absence or presence of the frontal sinus, more especially with reference to Lothrop's statistics, he was much impressed with what Lothrop said in his paper by the fact that he very rarely saw any frontal sinus. This statement was in opposition to the speaker's own observations. He found eighteen per cent of skulls, even a little more, in which one or both frontal sinuses were absent. The difference in results was due to the way of looking at the matter. He considered the frontal sinus absent if it did not lie above the level of the fronto-nasal suture. Anything which lay more in the orbital or ethmoidal plate—anything that passed above the fronto-nasal suture was frontal sinus, and he thought he was right when he recalled Lothrop's words to the effect that he (Lothrop) considered the frontal sinus present when there was extension into the orbital plate. Inasmuch as there were ethmodial extensions into the orbital plate, the speaked did not think we had any right to look upon them as frontal sinuses. This was the reason for the difference of opinion.

Dr. Wendell C. Phillips desired to call the attention of the members to the fact that the preparation of a paper of this kind meant an enormous amount of work. For two or three months Dr. Coffin spent a great deal of time in the preparation of the specimens he had exhibited, and the speaker felt that the society was indebted to Dr. Coffin.

Dr. J. A. Stucky was very much interested in, as well as edified by the paper, and yet a little surprised. He was surprised that with all the clinical material which New York city furnished, the essayist should have seen or had so few cases. Even in the little city where he hailed from, he had a record of seven cases. He was sure he had had more than that, but he could only find the records of seven cases which he looked up after he received the programme. Four

of these required an external operation. There was a fistulous opening, and a diagnosis had been made of dacryocystitis. All that was necessary in these cases was to enlarge the opening through the wound, curette thoroughly, and close it up. In the other three cases the external tissues were not perforated, and the condition was relieved by a free opening through the nose. The ages of these patients varied from two years and five months to eight years. In one case, eight years of age, the maxillary antrum was involved. All of them had adenoids. He made special mention of that as well as enlarged tonsils. In addition to the fistulous opening in two cases, he had ectropium without any adhesions.

The essayist mentioned a tubercular history. He did not find that existing in any of the cases he had seen, and all of them made good recoveries.

Dr. Robt. C. Myles said the members were indebted to Dr. Coffin for his demonstration. Having worked along these lines for many years, he knew what labor it took to present a subject so well as he had presented it, and there was no doubt but what we were in the dark in regard to these cases. Probably it was better for many of the patients that we were in the dark. Those who were careful observers saw quite frequently infectious diseases invade these sinuses, and they of themselves got well frequently, and it was only in that class of cases in which there was stenosis, obstruction or confinement of the pyogenic conditions (and it was only in that class of cases that one needed to operate, liberating the gases and pressure therefrom) which caused necrosis and sloughing of the mucosa.

In regard to the remarks made by Dr. Stucky, it must be remembered that there was only one of him in Lexington, while there were several hundred specialists in New York, and if they were to compile general statistics, they might come up with him. These cases were occasionally seen in children in which there was necessity for interference. Occasionally patients were seen who suffered from too much surgery as well as from the disease. When free drainage was established, and asepsis thoroughly carried out, very frequently many of the cases recovered in a most miraculous way. He thought the removal of those teeth which were still dormant in the antrum of children was very frequently the cause of the stubborn resistance to get better. He had seen cases of this kind, and thought if the region in which

these teeth were buried and growing was let alone, and the surgery was directed above them, we would get much better results.

The question of the frontal sinus and sphenoid was not near so important as the one of the antrum and ethmoid.

Dr. Coffin, in closing the discussion, said that Dr. Turner quoted Repke as saying that he seldom saw a case without the frontal sinus. Repke emphatically stated that it might only be present when there was extension into the orbital plate. The speaker said it was altogether a matter of understanding terms, and he thought it was time the profession got together and recognized the nomenclature of this subject. For instance, not long ago he listened to a paper in which the author spoke of the accessory ethmodial sinuses. He wondered what was meant by accessory ethmoidal sinuses. When he came to show the specimens, he found it was what Mouret had called ethmoido-lacrimal cell. It was very well named and one knew exactly where to look for it. It was very essential for one to arrive at some understanding in talking about these things. If one meant by frontal sinus simply a cavity in the vertical or cancellous portion of the frontal bone, he would be understood. If the doctor meant a cavity in any part of the frontal bone, he was entirely right. In the specimen which the speaker showed there was just the external part of the ethmoid cell. This was all. One could call that the frontal sinus, if he so desired, but it was questionable.

He was much interested in Dr. Stucky's remarks from a clinical point of view, although they had no direct bearing on his own paper. He was interested more particularly in what was said regarding the development of the cells, and it led up to the statement of Dr. Myles that frequently too much surgery was done in many cases, and that many of them get well without treatment. He believes in hammering away at this thing until the general practitioner recognized a condition that could be treated. A great deal could be done for these patients with treatment, and this treatment did not mean surgery.

One of the points he wanted to make especially in his paper was that in infants and children, and up to those shedding the first teeth and permanent teeth, we could not do a satisfactory external operation on the antrum.

Dr. Ewing W. Day and Dr. Chevalier Jackson, of Pittsburg, Pa., read a joint paper entitled:

Purulent Otitis Media Complicating Typhoid Fever.

The authors considered deafness, otitis externa, disorders of the perceptive apparatus, acute catarrhal otitis media, myringitis, and acute purulent otitis media as complications of typhoid fever.

In an examination of the ears of typhoid fever patients, they were at once impressed with the fact that practically all cases could be classified into two great classes, dullness of hearing with and without evidence of inflammation of the middle ear. This dullness of hearing was analyzed as to cause in fifty-one selected non-suppurative cases. It was found to be due to the tube in one, because the patient, a mild case, volunteered the statement that he heard better after swallowing three or four times, and on test was found to hear normally. Only twelve cases were catheterized as a test and they were all patulous. Dullness of hearing was found to be due to non-suppurative middle ear conditions in seventeen cases. Some of these might have been tubal. The perceptive apparatus, including the sensorium, was found at fault in twenty-three cases both perceptive and conductive mechanisms in ten cases.

The only complications were erysipelas and mastoid empyema. Erysipelas occurred in three cases. It was located on the face and scalp of all, but it seemed doubtful whether the infection was secondary to the ear condition. It occurred in a number of cases of typhoid fever uncomplicated by otitis, or any other lesion. It did not seem to influence the otitis in any way. Purulent otitis resulted from extension of the erysipelas in one case. Mastoid empyema occurred in twenty-six out of twenty-eight (29.5 per cent.) of the purulent otitis media cases. Mastoid tenderness occurred without pus formation in 31 per cent of the cases. This appeared at the outset of the malady, and always disappeared, in some cases not reappearing, and in others returning with pus formation in the mastoid cells. The large percentage of mastoid complications in the purulent otitis cases was due probably to three causes—virulence of the infection, lowered resistance, and the almost constant dorsal decubitus which favored the collection of pus in the antrum. This was especially true of cases where, on account of intestinal hemorrhage or other reasons,

the pillow was removed and the foot of the bed was elevated. Gravity had no opposition on account of the absence of the cilia in the mucosa of the aditus ad antrum.

Every purulent case of otitis so treated by elevation of the foot of the bed that did not die too soon of conditions remote from the ear developed a mastoid empyema. There were four of these cases, one unilateral, and three bilateral. All the bilateral cases developed bilateral mastoid empyema. The low resistance was shown in one case, where, after cleaning out the mastoid down to healthy bone, the first dressing revealed large patches of bone, dead because it had not sufficient vitality to resist invasion. There were no peculiar features about the mastoid cases except the very rapid destruction of tissue and the fact that the temperaure was absolutely normal for a week or more before the operation in fourteen out of twenty-six (53.8 per cent) cases. Evidently there was little power of absorption in the mastoid portion of the temporal bone. When the pus broke through into the soft tissues of the neck, as it was allowed to in one case, the usual pus chart appeared. In six cases out of twenty-six (23.1 per cent) the temperature ranged to 99 or 100 and back to normal. In 5 out of 26 (19.2 per cent) the range was to 104 degrees and back to 99 or 100 degrees, but in these cases the authors could not exclude the possibility of its being due to pus in other locations or to typhoid fever reinfection.

DISCUSSION:—Dr. Edward B. Dench congratulated the author on the very exhaustive study which they had made of these cases. What was said regarding the involvement of the perceptive mechanism in these cases was open to question. It was not necessarily due to involvement of the labyrinth. It was due to the involvement of the higher cerebral centers. The authors spoke of the complication occurring in 88 out of 780 cases, which was only a fair proportion of what one might expect in cases of acute infectious disease. One frequently found mixed infection in a great many cases of acute inflammation of the middle ear complicating the acute infectious diseases. A mixed infection was oftentimes a simple infection.

The authors' investigation in regard to the primary condition of the mucosa of the tympanum, that is, incising the membrane in the early stages of the disease before it was practically secure in typhoid fever cases, to determine whether the middle ear contained any pathogenic organisms or not,

bore out the assertion of a practitioner who made a series of experiments on this subject and concluded that pathogenic organisms were found in the healthy tympanic cavity. For instance, one would find the staphylococcus, the pneumococcus, the diplococcus, distinct from the pneumococcus sometimes, also the streptococcus in a normal tympanic cavity.

As to the appearance of the canal, in some the fundus was filled up by an epithelial plug, and this plug undergoing disintegration, when examined, was found to contain certain bacteria. This varied in different cases as the same as one found an acute purulent otitis occurring as a complication of any acute infectious disease. The appearance of blebs in the external auditory meatus and on the surface of the membrana tympani seemed to be characteristic of a severe form of otitis media and clinically characteristic of typhoid fever.

The development of acute otitis media in the course of typhoid fever depended very much upon the surroundings of the patient, that is, whether the patient was under the best hygienic surroundings or not, and upon the conditions of the patient at the time the typhoid infection occurred. This was borne out by the experience the speaker had had in typhoid fever cases. He had found a complicating otitis media rare in typhoid fever. He thought the resisting power of the patient at the end of the second week, or the beginning of the third week, and from that time on was a sufficient reason for the late development of acute otitis media. The otitis was simply favored by the run-down condition of the patient. This was the exciting cause. The dorsal decubitus was an important factor in favoring infection of the tympanic cavity by germs which might be present in the naso-pharynx.

Dr. J. A. Thompson asked the essayists whether they had under observation in their series of cases a complication that was sometimes confusing in diagnosis, but when observed accurately it was not, and that was, abscess of the parotid gland, which penetrated to and caused apparent suppuration of the ear when the ear itself was not involved.

He had been asked twice in the past year to make mastoid operations of such cases and had been able to demonstrate in both from the origin of the swelling that a large amount of pus came from a suppurating parotid gland.

Nothing more was necessary than a careful external incision to avoid the facial nerve. With this in mind, the

diagnosis ought to be comparatively easy in these unusual cases.

Dr. J. A. Stucky stated that 18 months ago he was called to see a case in consultation (typhoid fever case) in which there was a little ear trouble in the second or third week of the disease, which very readily yielded to local treatment. Ten days later the patient went into a delirious condition. He was told about it, and suggested the possibility of mastoid involvment, and perhaps otitic meningitis. This was laughed at. The patient died promptly, and at the post-mortem examination both mastoids were found filled with granulation tissue, the epitympanic wall eroded, the middle ear full of pus, and eustachian tube patulous. Since then he had held five post-mortem examinations on cases that died of typhoid fever and two of pneumonia. None of the five presented at any time symptoms of ear trouble, yet all showed degeneration of the mastoid cells and antrum, with the middle ear filled with pus. He was beginning to suspect, if any of his patients with typhoid fever had that form of delirium, with head tossing from side to side, involvement of the mastoid of which the general practitioner was not aware. So far as he knew, we had no pathognomonic symptom or symptoms of mastoid involvement. Some of the worst cases of mastoid trouble he had operated on had absolutely no symptoms of mastoid disease, so far as pain, swelling, etc., were concerned. He was informed by Dr. Von Klein, who was present, that in his investigations it was recorded by eminent observers that the bacillus typhosus and pneumococcus were frequently found in the ear when they were not found in the lungs, in the alimentary canal, or anywhere else. Whenever he saw involvement of the lympathic system in typhoid fever or in pneumonia, he suspected mastoid suppuration as a probable cause.

Dr. Carl E. Munger called attention to a case of mastoid involvement in typhoid fever for the purpose of emphasizing the point made by Dr. Dench in regard to the time of occurrence of the complication, which was during the latter part of the disease in his case. It occurred during convalescence. The man was of foreign birth, a Swede, and the conditions in the ward of the general hospital in which this man was were not ideal.

Dr. Jas. F. McKernon believed it was just as important to make a frequent aural examination in typhoid fever as in any other of the acute infectious diseases. If these examina-

tions were more frequent, we would have less trouble following that disease from chronic catarrhal affections of the middle ear and of the labyrinth.

So far as the prognosis in these cases of middle ear trouble was concerned (and he meant the chronic type following typhoid fever, in almost all cases it was bad, so far as recovery of normal hearing was concerned.

He differed from one of the previous speakers and believed that the disturbances were distinctly of the labyrinthine type, and not ot the cerebral.

Dr. Chevalier Jackson, in closing the discussion, said there were just a few points he would like to refer to, and one in particularly relative to extreme tenderness over the mastoid in the early days of the otitis. In many of these cases, on the first day or the appearance of the discharge, the mastoid would be so tender that patients would not allow one to touch it. Only a few of these cases ultimately developed pus. Sooner or later they all subsided, and whether it was a true periostitis or not, he did not know. When pus formed in these cases there was usually no tenderness. The ordinary mastoid symptoms were often absent, and yet the entire mastoid would be found broken down. There was no tenderness at all in some cases. One case in particular was brought in from a hospital in one of the smaller cities. The patient had typhoid fever, and was sent in as a typhoid case. There was a slight discharge from the ear, and in palpating over the mastoid one could feel that the whole cortex was broken in. One could feel a loose sequestrum composed of cortex. The whole mastoid was broken down, and yet the patient would not acknowledge that it was tender.

In regard to the criticism concerning the bacteriology of these cases, the statement in the paper was that acute purulent otitis media was usually, not invariably, mono-microbic.

In regard to epithelial plugs and blebs being characteristic of typhoid fever otitis, this was not stated. The paper was simply a record of observations. Very many of the cases presented the ordinary picture of acute otitis media.

In regard to parotitis, Dr. Thompson spoke of abscess of the parotid gland bursting into the canal. This did not occur in the cases of the authors, for the reason that the cases were all kept under observation and as soon as parotitis developed, the parotid gland was incised long before there

was pus formation. Pus did not form at all, and for that reason they did not get that kind of cases.

As to the diagnosis, one of the speakers stated that it was comparatively easy, and that after the discharge began an immense quantity of secretion poured out. It was bloody serum to begin with, and later became purulent in spite of all they could do to keep the parts aseptic.

Out of eighty-eight cases of purulent otitis media, twenty-five went on to mastoid abscess.

In spite of the best care they gave these cases, watching them every day, examining them with mirror and speculum carefully, they could not prevent the development of mastoid abscess.

One of the speakers said that he did not regard the number great; that is, eighty-eight cases of purulent otitis media out of seven hundred and eight cases, which meant that about 11.3 per cent of the cases of typhoid fever developed purulent otitis media. That seemed to them enormous. At the present time it was down to no cases at all, or was at the time they left Pittsburg.

Their research into the etiology was very extensive and interesting, and he regretted the lack of time that prevented its reading, for the discussion and criticism by the eminent gentlemen present would have been interesting and profitable.

Dr. Jas. F. McKernon, of New York City, read a paper entitled:

Chronic Otitis Media, Chronic Mastoiditis and Jugular Bulb Thrombosis.

The author reported a case of chronic otitis media, complicated by chronic mastoiditis and jugular bulb thrombosis, with operation and death. The patient, a boy of five, had scarlatina seven months previously, with a discharge from both ears. One ear ceased running after six weeks; the other continued to discharge intermittently. During the periods of intermission the child was peevish, drowsy, and constipated; the tongue coated; the breath foul. There were headache and earache. While the ear discharged the patient's condition was approximately normal. Three weeks after the ears became affected there was pain behind both ears, worse on the right side, for ten days. On examination the right canal was found red, excoriated, and filled with a foul, thick discharge. The drum was perforated over the Eustachian ori-

fice, and in the posterior superior quadrant granulations and dead bone were discovered. The left drum had healed. A diagnosis of intratympanic caries was made and operation advised, but refused, although the dangers of delay were pointed out. Under the usual palliative treatment the discharge stopped for a time, but recurred. About two months later the condition within the ear was found somewhat better. Operation was again urged, but was declined as before. Three months later the discharge increased again, and operation was agreed to. Examination at this time failed to reveal any signs of mastoid trouble, but the general physical condition was not so good. Temperature 99 degrees F. When the mastoid was opened the cortex was dark; the antrum, tip, zygomatic root, and several medullary spaces behind the sigmoid groove contained thick creamy pus. The bone was necrotic between the canal and sigmoid groove, down to the bulb. The posterior canal wall was removed and the typical Schwartze-Stacke operation done. A skin graft was placed over the entire middle ear cavity and antrum. All went well until the eighth day, when the patient complained of headache and photophobia and became restless. The temperature rose to 104 degrees, preceded by vomiting. The condition gradually improved for a week, with no marked variations in temperature. Several consultations were held, and irregular typhoid, central pneumonia, and meningitis were suggested. On the eighth day the child became drowsy and irritable, complained of posterior headache, and refused nourishment. After some delay in obtaining permission, an exploratory operation was performed, the writer suspecting an intra-cranial condition, resulting from the previous long suppuration. The child's physical condition at this time was poor. The bone over the sinus being removed, an incision was made an inch long, a gelatinous clot removed from the torcular end, establishing a good current from this direction. The bulb was then curetted and some firmer clot removed without establishing a flow of blood. The jugular vein was, therefore, resected together with several enlarged glands. The patient's condition was good at the end of the operation, but he never regained consciousness, and died twenty hours afterward. No autopsy. The author had since had two other cases with a similar history, in which early operation resulted favorably. He was unable to say whether or not any other intra-cranial condition existed in the case

detailed, but if so, it was obscure. There were no chills or chilly sensations to suggest sinus involvement.

In conclusion, the writer sounded a note of warning in atypical cases against delaying too long a search for the cause in the original focus of infection, when the patient did not progress well.

DISCUSSION:—Dr. Edward B. Deach agreed with the author that a good many of these cases ran an atypical course. He reported some time ago a case very much like the one narrated in which there was a low temperature. He had never seen a case of acute thrombosis with low temperature. He had seen cases in which the sinus had been exposed and obliterated as the result of a previous inflammatory process. Nature had looked after it and apparently he had to deal with an aseptic clot, with complete obstruction of the sinus. He had come across one or two cases in operating for acute mastoiditis.

One point which interested him was with reference to the advice given to patients with suppurative otitis media. He agreed with Dr. McKernon that, as a general rule, these cases must be operated on. There were certain exceptions, however, and he was afraid some had been a little too hasty in recommending immediate operation. He had in mind a case which came to him with an acute exacerbation of chronic suppurative otitis media. What was needed was to relieve the acute symptoms. He said to the patient that an operation was imperative for the relief of the chronic suppuration which had existed before. The patient's general condition was fair. Ten days after she came to him, with acute symptoms, he operated upon the chronic condition. The operation was absolutely successful. She was not on the operating table more than an hour and a half. The cavity was lined with epithelium and he felt perfectly safe. Within three days thereafter she died from pneumonia. He thought his judgment would have been a little better had he allowed her more time to recover from the acute attack rather than urge immediate operation. He thought it was dangerous to wait, and that was the reason he advised immediate operation. This case illustrated in a striking manner how careful one must be not to urge too early operation.

There was another question that came up, namely, the age of the patient. He recalled a woman, 67 years of age, who had had suppurative otitis media ever since she was six years of age, and he had been rather strongly urged by the patient

and relatives to operate. She had a good free opening in the tympanic vault, but the tympanic membrane was destroyed. There was free drainage of both the malleus and incus. In such a case his advice was to keep the ear clean and not operate unless acute symptoms developed, for the reason she probably would not live more than four score years, and if she had had this trouble for sixty years, she would certainly be able to go thirteen years more without any trouble. He might be wrong in his judgment, but to operate on every case of chronic otitis media because there was suppuration was unwise. He believed, however, the majority of cases should be operated on, and the only way a large proportion of them could be relieved was to do a radical operation, with entire destruction of the tympanic cavity, opening the mastoid antrum, middle ear and external canal, and lining it with skin. In people of fifty and sixty years of age, who had had this trouble for many, many years, and the discharge from the ear was not undermining their health, a good deal could be done for them by keeping their ears in a sanitary condition, and one might allow many of these patients to go on as they were rather than subject them to an operation, which, although it was but slightly dangerous, possessed an element of danger the same as any other operation.

Dr. Frank Allport said a very large majority of the cases of chronic otitis media ran a certain course for years, especially if subjected to good local treatment, and nothing very serious occurred in a large proportion of them. When one was called upon to advise as to what the patient should do, he was in a position to give the advice without any hesitation whatever to submit to an operation. Nevertheless, cases of this kind gave us an opportunity to preach to ourselves and to our patients as to what was the average course to pursue. What advice should be given in the vast majority of these cases? Dr. Dench's remarks were *apropos*. One had to be governed by the circumstances and conditions of the case. Perhaps there was scarcely a gentleman in this room who would not give some advice similar to that given by Dr. Dench to an aged person with regard to operating upon a quiescent chronic purulent otitis media. Nevertheless, at the present time the profession was steadily becoming more and more, from year to year, confronted with the problem as to what could be done in these cases. A very large majority of them were not tympanic in their nature nor tubal.

Most of these cases had their pathological supply from cavities that were back of the tympanum—the hiatus, antrum, and in many cases the cells themselves, although in the majority of cases he had operated on the cells had not been very much involved. Provided trouble was there, and it was in most cases, it was known that it was beyond the reach of ordinary methods. We could not reach the aditus ad antrum and cells by the ordinary treatment, with syringing, cleaning, powdering, and drying, and even by the treatment that the president of this association (Dr. Norval H. Pierce) advocated in many cases of acute middle ear trouble drainage treatment. We could not get at the trouble by this treatment. It was beyond our reach, and therefore, it seemed to him that in not advocating operative procedures in the average case, after the disease had run a reasonable length of time, six or eight months or more, under good treatment, and had not yielded, we were not pursuing the proper course. He considered it good advice to say to these patients in the vast majority of cases that they ought to submit to a radical operation. This was certainly the course that was advocated in all other fields of surgery. Not for one moment would a general surgeon allow necrosis or pathological tissue to exist in other portions of the body without advising its extirpation, and he did not see why otologists should go on treating these cases by syringing, cleaning, drying, etc., when it was known that such treatment could not possibly reach the real seat of the trouble. All realized that many of these cases were kept in a reasonably quiescent condition. Some remained healed for an indefinite length of time if there were good drainage, if there were no obstruction to drainage of the ear, but even then, if the pathological supply was situated in the mastoid portion of the temporal bone, where it lodged in a position where it could not drain out, the conditions were such that ordinary treatment could not possibly reach them. While he did not believe in the wholesale advice that all of these patients should submit to operation, he thought the members of the profession should have the courage of their convictions, and they should advise in the vast majority of cases that these patients undergo a radical operation.

Dr. Robt. C. Myles said Dr. McKernon had presented the report of an interesting case, which was worth more than a hundred successful cases. The accessory sinuses and middle ear were always surprising the members of the profession.

He had often asked otologists, but never received any answer, as to what percentage of middle ear suppurations were fatal. In what percentage of cases was it absolutely essential to carry out operative procedures? A large percentage of these cases got well of themselves. What was the percentage of risk attending operation? As we advanced and became better acquainted with the anatomy of the mastoid process and surrounding parts, and as we became accustomed to removing these parts, liberating the confined pus and removing pathological conditions, operation was becoming more and more safe, and he thought the essential points in regard to operation were a thorough study of the anatomy and acquaintance with the method by which we removed the cortex and the parts that lay between the external surface and the part we were endeavoring to get at. He would admit that those who were extremely conservative were swindled out of many operations. But did it pay them? In the last few months he had treated some twelve or fifteen cases of otitis media, with the classical symptoms of involvement of the mastoid. Tenderness was complete. He resorted to incision of the membrana flaccida and drum membrane, there being a complete opening in nearly all of them. The patients recovered.

A short time ago a little girl was sent to him by her friends. He delayed her case a short time. Her rectal temperature was taken twice, and it never went above 99½ degrees. A mastoid operation was performed ultimately, and the bone over the lateral sinus had become diseased. She had beginning sinus thrombosis; the membrane was inflamed. He removed the bone cavity over the affected area without destroying the periosteal attachment of the bone. She recovered. The point he made was that by waiting two or three days more he would have lost the patient, and it would have been better to have operated on the other patient than to have lost this one. If one did not enter the cranial cavity, he thought the results in these cases in ninety-nine out of a hundred would be good.

Dr. A. Logan Turner said that when he asked Dr. McKernon in a conversation what was a chronic middle ear discharge, he did not mean to suggest for one moment that he was not justified in doing a complete radical operation in the case reported. Should a complete mastoid operation be done in cases which had only discharged for seven months? What was the time limit between a subacute and a true chronic otorrheal discharge? He would like to get an answer from

men of the experience of Dr. McKernon in this work. He would himself say we were justified in allowing a case to discharge for a year before we were finally forced to do the Stacke-Schwartze operation. He was interested in this subject because of having had the case of a child under his care in whom there were no rigors, hardly any elevation of temperature, and he removed a portion of the jugular vein in that case.

In regard to the remarks made by other gentlemen concerning the percentage of fatalities, this was always an interesting subject; also in regard to the age of the patients. Up to thirty years of age the intra-cranial complications were much more frequent, but after that age they were very much diminished. The older the patient became, the less the risk of these intra-cranial complications.

Dr. Norval H. Pierce said that the vast majority of cases of jugular bulb thrombosis were not found in the chronic cases, but in the acute ones, say within the first two or three weeks of the beginning of the disease, and after that, within six months of the development of the process. In fact, it was rarely found in chronic suppurations of the middle ear.

Dr. McKernon, in closing the discussion, said he had very little to add except to say that a low temperature did occur in jugular bulb thrombosis. The cases which he reported two years ago were watched from the onset of the disease; they were operated on, and a clot taken from the jugular bulb and sinus. The patients made good recoveries.

During the past year he had seen one case in his own practice, and one in the practice of a colleague, in which there was a continuous low temperature from the onset. There might have been a high temperature previous to the time the patients came under observation. But if so, that was the only elevation of temperature. The case was not watched before coming under his observation. While this was not at all the rule, he believed there were a number of them attended by low temperature. In his case the clot was well organized.

He had been misunderstood in regard to advocating operation on every case of purulent discharge from the middle ear. He did not. One of the requirements he made was that when dead bone was present he would operate. He did not wish to be misunderstood in regard to that point. If one found on first examination, after he had cleansed the canal and middle

ear, bringing to his aid the probe, diseased bone—he did not mean exposed bone—he believed it was the duty of the otologist in every instance to advise operation. He should lay the matter distinctly before the patient or family, and if they did not wish an operation performed, let them accept the responsibility of the future outcome of the case. If one simply said to them, this case might go on for years without giving much, if any trouble, they would quote him always as saying that, and if the case should end fatally, he was blamed by the whole family, relatives and friends. He did not wish to be misunderstood in regard to that point. Only when dead bone was found present upon examination would he advocate operation. Under no circumstances would he advocate an operation simply for a purulent condition without dead bone being present.

There was another point referred to by Dr. Dench. If one found dead bone present upon first examination, he was very apt to find it present throughout treatment. There might be a covering over of the exposed bone, and one might find the necrotic process quite as distinct several months after examination as when he first saw it. In the case reported drainage was poor. There was a large opening when the case was first seen for the tubal entrance in the middle ear, which subsequently became closed, but the opening on a level with the short process was still present. There was granulation tissue present, which protruded through the opening, and this was evidence of intra-tympanic caries in a case of continued suppuration.

If he understood Dr. Myles correctly, he spoke of the percentage of risk attending these operations. He did not think there were enough cases collected to give any definite data in regard to that. In a collection of something over four hundred and sixty cases of purulent disease of the middle ear, data which he collected himself, seven per cent of that number had intra-cranial complications.

Regarding Dr. Turner's question, as to what comprises a chronic condition of the middle ear, he would simply repeat what he stated in a paper read before the association last year, namely, given a case of purulent disease of the middle ear, with or without treatment, that had lasted six months, he should classify it under the chronic stage, and he thought one was justified in so doing.

Dr. Turner's remarks in reference to the number of intra-

cranial complications which took place in these cases were true, the larger number of them occurring under thirty years of age. As these patients become older, they bore resistance much better, as the cavity of the bone through which the disease had traveled was thicker and longer, and in some instances the virulent condition of the poison became somewhat eliminated before it reached that stage.

Dr. G. Hudson Makuen, of Philadelphia, read a paper entitled:

What the Larygologist May do for the Correction of Some of the More Common Forms of Defects of Speech.

The author, after dwelling upon the growth and expansion of the work of the laryngologist, rhinologist, and otologist, continued by saying that they had neglected a field which seemed to him to be of great importance. He referred to that of defects of speech, the treatment of which had either been entirely neglected or relegated to quacks. The medical man should do all in his power to suppress quackery, both in the interest of suffering humanity, as well as in his own interest. It had been estimated that there were over three hundred thousand stammerers in the United States alone, and this was only a small portion of those having some form of defective speech. Every one of these cases, in his opinion, was a proper subject for medical supervision, and he thought that these disorders of speech should come within the domain of the laryngologist, rhinologist, and otologist, and that defects of vision were scarcely of more importance than defects of speech. He estimated that the exciting cause in ninety-eight per cent of all cases of stammering might be looked for in a morbid condition of some portion of the respiratory tract. Adenoids, enlarged turbinals and chronic rhinitis were causes of stammering. The laity and some physicians thought children would grow out of speech defects, and, therefore, they become nerve habits before any treatment was given. The author explained why children stammered, and he also explained his treatment, which consisted in the removal of all physical obstructions to normal respiration, and in the teaching of physiological breathing and the elementary sounds used in language. Digestive disturbances should be corrected, tobacco and stimulants of all kinds interdicted and the nervous system supported by nourishing food and plenty of sleep. A little mental science must be wisely mixed in with the

treatment, and suggestion always played an important part. He had found the use of hypnotism of immense value as an adjujvant in certain selected cases, and he emphasized the importance of syllable speech. There were forty-four elementary sounds used in language, represented by the letters of the alphabet. The articulation of a word was a combination of two or more elementary sounds arranged in their proper sequence, and a syllable was a combination of elementary sounds which might be given with a single respiratory impulse. Words of two or more syllables should have as many impulses as there were syllables. Stammerers should be taught to speak, and as far as possible even to think, in syllables.

DISCUSSION: Dr. Max A. Goldstein said there was one feature about the paper which he thought might bear further elaboration, one the author touched on, but did not develop as much as he did the local manifestations and their remedy, and that was the actual cerebral deficiency or difficulty encountered in speech defects in the stammering and stuttering form. Of course, this touched the question of defective development not only of speech in its central origin, but also the sight and hearing. In a number of cases with which he had come in contact lately, these features had borne a close relation to one another. He found that in the development of the speech faculty of such a patient that the general education of the child, both as regards defective hearing and defective sight, must be considered and given training.

Dr. Hanau W. Loeb said that the essayist had for some years been endeavoring to bring before the various laryngological associations this subject in such a way that it would be better appreciated, not only from the standpoint of what could be done for these patients, but also from the standpoint of what the laryngologist could do and should do. He had brought before the association in a very succinct way general rules and observations which were to be observed in connection with the attention which these cases required, and he thought really, after all these years of work, it was high time for the profession to take more interest in the subject and aid him in developing this work, taking it out of the hands of those who were incompetent.

He thought hardly anything could be added to the somewhat elemntary consideration of the subject as presented. He did not quite fully agree with the author with reference

to respiration. If he understood him correctly, he stated that on account of a lack of proper respiration there was an accumulation of carbonic acid in the blood which interfered with speech production. This would be a difficult thing to prove. It was known that the respiratory center was stimulated by a lack of oxygen. If the number of respirations were not sufficient to carry off carbonic acid, they were not sufficient to supply the requisite amount of oxygen, and the consequence would be that the respirations would be increased in frequency and the supply of oxygen heightened. Unless the author had ample proof, he would be inclined to differ from him in that particular.

Dr. Price Brown was pleased to have heard the paper because it brought to his mind a case that recently came under his observation. A clergyman, who had been preaching for ten years, had tried his best to improve his vocalization, but often found it impossible to sound the vowels separately. He thought the difficulty would be with the consonants, but these he could sound very well. The clergyman came to him with the idea that possibly some nasal or throat operation might remedy the defect. He examined the throat and found several adenoids. These he removed, not with the expectation that their removal would have any effect in improving his speech. However, very soon after the operation the patient was able to sound his a's and i's distinctly, but had difficulty some times in sounding his o's, and would make great effort to do so. However, after due time following the removal of the adenoids, he could sound his vowels as well as his consonants.

Dr. Makuen, in closing the discussion, replying to the remarks of Dr. Goldstein, said that he did not go into the psychology of stammering particularly, although he thought the cerebral conditions had more to do with stammering than with some of the other forms of defects of speech. There were some stammerers who did not know they stammered, There were some forms of defective articulation in which speech was unintelligible and the person did not know that there was anything peculiar about his speech. This was a curious thing. Each one of us had peculiarities of speech. A man with very defective articulation often times did not know that it was defective until his attention was called to it. It satisfied his own ear and his own mind, and that was sufficient. Mental expectancy was often an immediate cause of

stammering, and he mentioned hypnotism as a possible means of removing this condition.

The relation of hearing to the various forms of defects of speech was interesting. They were closely related. He had a little child under his care, five years of age, who never spoke at all until about a month ago. The child heard the sounds of music, enjoyed opera and concerts, but did not know the meaning of the sounds of speech. The child should not interpret words. Such a child must be taught the meaning of words just as a baby learned the meaning of words. The child was not deaf except for speech.

With reference to the remarks of Dr. Loeb concerning the effect of carbonic acid upon the circulation of the brain, he would say that he mentioned it as one of the possible causes for the aprosexic condition so often found in stammerers. The stammerer often did not think properly, and therefore, could not speak properly.

Dr. T. Passmore Berens, of New York City, read a paper entitled:

Multiple Chronic Sinusitis Operated Upon by the Maxillary Route.

The author reported a series of fourteen operations through the maxillary route, with empyema of the maxillary antrum, ethmoid cells, and sphenoid sinus. The operation which he described in detail was performed as he saw it carried out by Jansen, of Berlin. Following the description of the fourteen cases, Dr. Berens concluded with these remarks: To summarize, all of the patients but one had disease of the sphenoid sinus; in twelve of these, occipital and vertical pains were present; in eight—all with sphenoid disease—the pains extended also into the face and were neuralgic in character, while in four cases pains closely simulated tic douloureaux. These cases were all cured except two, namely, case twelve, which was malignant, and case nine, in which suppuration returned several times in the sphenoid, each return being marked by an attack of "tic." It seemed to the writer that the presence of pain in the vertex and occiput or in trigeminal neuralgia when accompanied by pus in the posterior nares was symptomatic, almost diagnostic of sphenoid disease. In twelve of the patients there was pain in the region of the eye, especially in the region of the inner canthus. This pain was explained at the time of operation by the finding of disease in the most anterior ethmoid cells. In all of the cases excepting

case five, there was a total absence of frontal sinus disease; and since they all were chronic cases, most of them of many years' duration, it was interesting to ask, what factor was present to preserve the frontal sinus from the primary infection, to cure it if it was infected, or to protect it from subsequent invasion by the disease already established in the ethmoid region? Were the teeth the prime factors of the infection of the antrum, with a subsequent extension of the the suppurative process upward and backward into the ethmoid cells and sphenoid sinus; and, if so, why, again, did the frontal sinus escape? In eight of these cases the teeth were found diseased at the time of operation, or there was a clear history of diseased teeth, at least of dentalgia. That diseased teeth caused many cases of antrum disease was not questioned, but, on the other hand, the writer believed that many a tooth had been sacrificed when proper treatment of the antrum would have saved it. A tooth having roots protruding into a suppurating cavity, the roots protected by only a thin mucous membrane periosteal covering, could readily become diseased by contiguity of tissue; and the writer maintained that in some of his cases this actually had taken place, at least to the extent of producing dentalgia. In all of the cases excepting Case 12 and Case 9, there was a complete and permanent relief from pain following the operation. Of the nine cases operated upon more than a year ago, four had had a return of pus. Two of these cases were in the ethmoid region, and were cured by subsequent curettement; one was malignant, and one was in the sphenoid. The continued suppuration in the latter case was probably due to a prolongation of the sinus into the wing of the sphenoid bone, or some other similar condition. The return of pus in the ethmoid region was the result of fear borne of inexperience of perforating through the internal plate of the ethmoid. Experience having given a better technique, the cases operated upon later had practically a complete exenteration of ethmoid cells, and had not since suppurated. There had been a troublesome crust formation in four cases; but there was an atrophic process present throughout the whole of the nasal cavities before operation in these patients. The tear duct was cut off in at least half the cases, but this had caused no symptoms, the duct simply emptying higher up. Arterial hemorrhage deep in the wound was easily controlled by artery forceps in three cases. The possibility of hemorrhage in this locality certainly demanded the

most open kind of a wound that it was possible to secure in any operative procedure that might have to be undertaken. In any of these three cases the hemorrhage would have been practically beyond control had the operation been performed by the intra-nasal route.

In conclusion, the operation as described was advised only after a careful study of each case, and where the hope of a cure by milder measures could not be held out to the patient.

DISCUSSION: Dr. Robert C. Myles said that no one hailed with greater pleasure and delight any progress in the treatment of diseases of the accessory sinuses than himself, and he had always tried for many years to do radical work with conservatism. There were many things that occurred in this class of cases that astonished us sometimes. One of the most remarkable things was the relief of pressure upon the venous circulation from operations in these cases; that is, in the return of blood to the heart. In removing the median wall between the nose and antrum, he had noticed a marked improvement in the condition of the ethmoid and sphenoid sinuses. In the so-called polypoid state, by extensive exsection of this region, after operation there seemd to be a sympathy between the different parts. Frequently the frontal sinus was involved, and a radical operation over the antrum, removing the median wall, would cause the frontal sinus to get well. Why, he could not say. But here had been a remarkable improvement in the ethmoid and frontal sinuses without cutting out the ethmoid cells. Thorough removal of the ethmoid cells was questionable in his mind. He had never seen it done. The ethmoid cells were quite extensive; they extended up into the frontal sinus above the orbital cavity; they extended behind the orbit, posterior and external to the sphenoid cell. The expression "through removal" of the ethmoid cells was frequently used, and after having removed half a dozen there were many left. He did not think it would be considered safe to remove them all. If a number of them were removed it was sufficient.

He had never had the opportunity of studying these cases through the antral route before and after operation. He had removed the median wall of the antrum or a part of the inferior turbinal through the antral route. He had thought it well to remove whatever he desired through the nasal region, and he had not had the experience the author had had to form an opinion that would be worth much. He could not

understand how the author could do with a sharp curette what he said he did. He had tried it often; he had curetted thoroughly parts of the ethmoid, and every time the curette would dangle about. It was slippery, and he had to use forceps or rongeur to remove the fragments. He had not been able to clear this field in the manner in which it was done by many operators with the curette.

The results obtained by the author were most excellent, and he thought as much of the benefit of the operation came from the removal of the tension on the circulation in the neighboring parts as from entering these cavities. In many of these cases probably the frontal sinus was involved, and that when the author removed pressure from the venous return, the absorbent lymphatics and others took up the morbific product, thereby resulting in a cure of the parts that were apparently diseased.

Dr. A. Logan Turner said he had had no experience with the operation described by the author of the paper, consequently he did not feel competent to discuss it. However, after the author's description of the operation, he congratulated him upon his success. When he got back to work he would certainly do the operation in the first case that was suitable. We ought to cure patients if we could, and he expressed the belief that this was possible; but what always seemed to him unpleasant was this large permanent opening between the nasal chamber and the antral chamber. He wondered whether the author could predict what the future of these patients would be in regard to taking colds, ordinary catarrh, whether there was risk of these patients getting their colds, as it were, in their opened up antra rather than in their nasal cavities.

Dr. Chas W. Richardson said there was one point in the paper little understood, and that was with reference to packing for three or four weeks. The speaker had done the operation just as the author had described it, and he had found it difficult to keep the packing in. In a case he had recently the packing fell below the uvula. He did not know what method the author adopted for keeping the packing in place. Most patients, when they had anything in the nasal cavity, drew and invariably drew the packing down into the pharynx, and if they drew it down it was unpleasant to have to remove it. So he had given up packing in these cases. He would like to know how the author retained the packing.

Dr. Berens, closing the discussion, in answer to Dr. Myles' criticism as to the use of the sharp curette, said that in his hands it was quite satisfactory. He could make as clean a wound with the curette in this region as he could in any mastoid operation. Shreds of tissue did not follow its use. He went either through the posterior ethmoid cell or through the natural opening of the sphenoid, as happened to be the more convenient, and curetted downward and outward, and he had not had any trouble in using the large curettes in breaking down the anterior wall. He saved as much of the anterior wall external to the spheno-palatine foramina as possible. If he did not do this he might get a troublesome hemorrhage, and in spite of the utmost care one might get severe hemorrhage from the spheno-palatine vessel, and this possibility was one of the strong points in favor of this operation, for one could readily control the hemorrhage in breaking down the anterior wall because of the large wound.

So far as not being able to remove all the ethmoid cells was concerned, one could take away the lateral masses, if he was careful in his technique.

All of the cases of tic he mentioned in his paper were those occurring in patients in whom there was no tension from confined pus. They were all cases that had previously been operated upon intra-nasally or through the canine fossa, one by himself and several by New York rhinologists. The sphenoid cells were open and were discharging pus freely; the ethmoids were discharging, also the antrum. An old lady, 72 years of age on whom he operated, got an attack of tic every time she had pus in the sphenoid, and there was a hole as large as a quarter of a dollar in the sphenoid. Notwithstanding this, she got an attack of tic douloureux every time pus collected there.

In regard to Dr. Turner's question, he would say that in Case 4 the patient recently suffered from a severe coryza, with a muco-purulent discharge from both nostrils, but it caused much less trouble on the operated side and cleared up much more rapidly than on the affected side. This happened in three other cases.

In regard to packing, after he took out the packing inserted at the time of the operation, he did not re-pack. As to keeping the packing in, if Dr. Richardson would insert the packing well up into the sphenoid sinus, he would catch

the upper end and prevent the lower part from falling behind the uvula.

Dr. H. Holbrook Curtis, of New York City, read a paper on

The Sphenoidal Sinus and its Surgical Relationship.

This was an interesting anatomical description of the sphenoidal sinus and its anomalies, its pathological conditions, his procedure of operating and subsequent treatment.

DISCUSSION: Dr. A. Logan Turner said the subject of sphenoidal sinus disease was more or less in its infancy. Perhaps this was putting it rather too strongly, but we were still groping somewhat in the dark as to the best method of attacking it. He thought the more recent work, as exemplified in the paper of Dr. Berens, showed that we were getting more into the general line of treatment. He had been impressed with the German literature on sphenoidal sinus suppuration, and by the apparently enormous number of cases which German physicians had under observation. One was not able to diagnose this condition in all cases. Certainly, one's experience was such as to make him believe that sphenoidal sinus suppuration was very common.

He would like to hear from Dr. Curtis and others as to what the percentage was of sphenoidal sinus disease they met with in their clinical practice. The time was coming, if it was not already here, when we should look for a collective investigation of all sinus work. He had sometimes thought of taking the matter up himself, taking the time and opportunity to get from all of the rhinologists of the world an expression of opinion as to the number of cases seen by them, the chronicity of the cases, the method of operating, the results, the fatalities, relapses, the successful cases, the non-successful cases, then we would have valuable data and know where we were and would get some idea as to the best methods of dealing with cases of accessory sinus invasion.

Dr. Robt. C. Myles thought Dr. Curtis' plan of procedure was the one that had been usually adopted by operators. In regard to the number of cases, very frequently there was simply a discharge of muco-pus, but the cases where the periosteum had been denuded, where there was a carious or necrotic area, or where there was some process going on invading the bone and in the future would invade the brain, were relatively rarer than the other class. In that class of cases we had

evidence of destructive change, perhaps necrosis or other changes in the bone, and it was imperative to operate upon them. In removing the middle turbinate and posterior end, he had taken away as much of the anterior wall as he could. The curettage had been cautiously performed. He had gone into the sphenoid sinus with delicate curettes and found the wall practically gone. He had had cases with meningeal symptoms. He never curetted extensively, and the patients had all gotten well when it seemed to him that it would be impossible for them to get well. The outcome had been a surprise to him in many cases. He could show cases of several years' standing, with a large opening in the sphenoid, that were practically normal except this large opening. The phenomena of pain and other distress were characteristic; and the secret of success was due to the large opening. These openings should be made by excision of the membranes that formed over them again from time to time. It was a simple thing to excise them.

Dr. Curtis, in closing the discussion, said he did not intend to discuss the various operations that had been described from time to time for cases of empyema of the sphenoidal sinus.

In regard to Dr. Turner's question as to statistics showing the percentage of sphenoidal sinus cases, when in Berlin two years ago he investigated the statistics given in the larger hospitals there, and found that the percentage of sinus cases in proportion to the attendance at the Berlin clinics was 50 per cent greater than the percentage we had in the largest clinics in New York. If one saw the number of patients with bandaged heads walking the wards of the hospitals there, he would realize this. Sinusitis being contagious, its frequency was accounted for very largely by the absence of fresh air in the crowded portion of the city, sleeping with windows closed, and insufficient nourishment.

The operation he described in his paper was, as far as he knew, the first one of its kind performed, and it was rather interesting to look back upon it now.

Dr. Berens reported fourteen cases yesterday, in which he made the operation advocated by Mouret and Jansen, a procedure which was only to be undertaken when there was disease already existing in the maxillary antrum, and in the ethmoidal cells. It would be an injudicious operation to undertake if the antrum was not diseased, and the ethmoid cells not already

invaded. In such cases a simple opening of the anterior wall of the sphenoid would be all that was necessary.

In opening the sinus from the region of the maxillary antrum, taking the route between the ostium maxillare and palatal bone, one would be apt to infect cells not already diseased. He had not gone into that question at all, preferring to leave the subject of operation for another occasion.

Dr. S. E. Solly, of Colorado Springs, Colo., read a paper entitled:

The Treatment of Tubercular Laryngitis.

The author said that while it was true that the ultimate results of laryngeal treatment were greatly influenced by the accompanying pulmonary disease, yet what could be done by wise topical treatment over and above the general treatment was shown by the following statistics of cases treated in Colorado. Taking the results in laryngeal cases without considering the ultimate fate of the patient, there was permanent arrest of the local disease in 64 per cent; temporary arrest in five per cent additional cases, in which latter the tissues again broke down shortly before death. Looking at the ulcerated cases alone 50 per cent healed permanently, and ten per cent temporarily.

After giving the reasons why laryngeal tuberculosis should be treated to its fullest extent, the author considered at length the pathological conditions.

As to the treatment, the first essential was to place the patient under the best hygienic conditions, especially under the open air treatment in a good sanitarium. The second was a change to a good climate of which the preferable elements in their order were dryness, sunshine, cool air, and a high altitude. The third essential was local treatment by an experienced laryngologist.

Discussion:—Dr. Frederick C Cobb said that in the surgical treatment of tubercular laryngitis he had removed portions of the arytenoids and curetted pretty thoroughly, and by so doing it had been frequently possible to prevent further invasion of the larynx by the tubercular process. He thought the necessity for operating on laryngeal tuberculosis in a climate which would give the larynx a chance to get well was important. It was not easy to operate on cases of tuberculosis of the larynx, and several times he had seen adhesions form between the inflamed surfaces, an objection which should be

considered. In removing portions of the arytenoids it was found that the tuberculosis was sometimes so deeply situated that no amount of climatic conditions or any medicinal agent would have any effect on the process.

In regard to the injection of lactic acid, which Dr. Solly recommended, he would try it. In Boston, if the patients were unable to go away, he had found lactic acid very beneficial in the ulcerative cases, and even in some of the more recent forms of the disease it seemed to effect the cure of the pathological process, while in edema it seemed to have little or no effect.

Dr. Price Brown supported what Dr. Solly had said in regard to the open air treatment of laryngeal tuberculosis. We at the Western Hospital treat all cases of tuberculosis of the lungs by the open air method, and why should not this treatment apply equally well to those cases in which the disease involved the larynx? They should be treated in tents, winter and summer.

As to local treatment, he endorsed everything the author of the paper had said. If one had patients in a fair condition of health who could come to his office daily, he could treat them with lactic acid. His plan usually was to wash out the pharynx with an alkaline solution, then apply a five per cent solution of cocaine to the larynx, which was followed immediately by the application of 50 per cent lactic acid to be applied every second or third day. Under this treatment the larynx usually clears up, the ulceration passes away, and the patient improves.

In cases in which stenosis of the larynx was sufficiently marked to produce danger to life, and in which the lungs were not materially affected, he believed in tracheotomy. In one case of tracheotomy he reported last year he found so much infiltration of the larynx that the man's life was threatened. This man had worked all the winter with a tracheal tube in his throat. The first half of the winter he worked four hours a day with it, and the second half eight hours a day. He remarked last year that the epiglottis was gone, and the ventricular bands were bound down by adhesions. The larynx was closed too much for him to breathe easily, and he did not try to expand it for fear of auto-infection. He thought the disease had entirely disappeared. The man's temperature was normal; pulse in the morning normal, and in the evening slightly accelerated. He had not had the slightest rise of tem-

perature since. No cough. He had worn a tracheal tube for a year and a half, and had worked for the last six months steadily.

Dr. Arthur G. Root said that if one did his full duty to cases of laryngeal tuberculosis, he must carry out the suggestions laid down in the paper. Lactic acid stood as the first remedy in this disease. So far as anesthesia of the larynx was concerned, prior to the use of lactic acid, he believed that cocaine when combined with adrenalin gave the best results. He thought the adrenalin acted much better when combined with cocaine, and the cocaine when combined with the adrenalin.

Dr. Price Brown had emphasized an important point, namely, laryngeal rest. Some time ago the speaker received a letter from one of the New York hospitals asking him for data regarding a certain man whom they had in their wards, whom they said when he presented himself, had worn a canula for some time, and that he had operated upon him some years previously. He looked up the hospital records and found it was an unusually interesting laryngeal case. The man was a marvel in physique. When he stripped him and went over his lungs he was perfectly surprised. The man had great physical strength, and apparently laryngeal tuberculosis had disappeared. He was a butcher by occupation. He operated on him for laryngeal stenosis due to tubercular infiltration. The man got well and was able to do anything he desired to do. He traveled all over the country, amused himself and raised a little money by throwing tobacco smoke through the canula and other things. When two or three years afterwards he examined his larynx, it was very much better. The process had become arrested by laryngeal rest. It might seem radical to say that a case of laryngeal tuberculosis was cured in which there was pulmonary tuberculosis.

Dr. J. A. Thompson said that one of the most important statements in Dr. Solly's paper was in the beginning, namely, we could prevent most of these severe laryngeal complications if the patient came early and the larynx was systematically treated before the stage of ulceration. The fact was general practitioners in Cincinnati had come to recognize the importance of this, and he was treating the larynx in many of their cases with beginning pulmonary disease, and the percentage of cures from combined treatment was large, even in cases where one would expect a fatal result. A patient with ulceration of

the larynx was not necessarily doomed. He could recall one case still living who had a tubercular ulcer in the larynx twelve years ago.

His method of treatment to prevent infection in these cases was a little different from that outlined by Dr. Solly. Dr. Jonathan Wright had shown that the direct invasion of the larynx was possible from the sputum if the larynx was acutely inflamed. If there was no acute inflammation, there was no direct invasion from the epithelium. By the systematic use of tracheal injections it was possible to greatly diminish the amount of expectoration and to render it much less virulent. In these cases his method consisted of daily injections, or injections every second or third day, depending on the severity of the case, into the trachea, using either menthol, camphor, creosote or guaiacol sometimes combined. One could prevent extensive inflammation in this way even in cases where the pulmonary disease was carrying the patient on to a fatal result. In cases in which the cough was so severe that the patients were restless and got no rest at night from incessant laryngeal tickling, one could control the cough, tickling and irritation for four to eight hours by one injection, giving the patients a chance to retain their meals and sleep at nights.

He had tried to impress upon the general practitioner the importance of beginning laryngeal treatment early and systematically, and by so doing he could prevent the severe lesions that were the cause of the indescribable suffering in tuberculosis of the larynx.

Dr. Chevalier Jackson corroborated what had been said regarding the beneficial effects of tracheotomy in primary tuberculosis of the larynx, in which there was absolutely no pulmonary involvement. He had at home three patients who were wearing tracheal canulas, every one of whom got much better after tracheotomy. In every case in which the larynx was affected tracheotomy would help materially on account of the degree of rest which it afforded the larynx. He used to be skeptical in regard to this. The respiratory movements of the larynx went on very much the same whether air passed in and out or not. There were associated muscular movements which went on even when the air current did not pass through, yet a certain degree of rest must take place, for clinically there was much less irritation. Tracheotomy as a prelininary measure made the radical treatment of the larynx safe. The lactic acid treatment was undoubtedly of great

value in cases of laryngeal tuberculosis; yet when there was stenosis and edema of the larynx the patients could sleep much better if they wore a tracheotomy canula, besides its beneficial influence. He had seen cases of laryngeal tuberculosis get well, when other practitioners doubted it was really tuberculosis, and he had felt a little skeptical about it himself. He exhibited one such case before the Section Meeting in Pittsburg. Dr. Phillips, Dr. Pierce and others saw the patient. Dr. Phillips said, before looking at the case, he never saw a patient with laryngeal tuberculosis get well, and after examining the patient he repeated the statement. So he presumed that Dr. Phillips doubted the correctness of his diagnosis. There was absolutely no lung involvement in the case, and yet there were tubercle bacilli in the sputum. If there were any lung involvement, the finding of tubercle bacilli in the sputum would have been of very little importance. The patient had lived seven or eight years since her case was diagnosed as one of laryngeal tuberculosis by the late Dr. Daly and himself, and was still well, although deformity of the larynx existed, and the epiglottis was "mouse-gnawed."

Dr. Robt. Levy said that every now and then one heard from men throughout the country regarding the advisability of mild measures, and of the great detriment done to patients by radical measures. It was gratifying to hear the gentleman agree with Dr. Solly relative to the radical treatment of laryngeal tuberculosis. We were apt to get into a rut. He thought the pendulum was now swinging in the other direction. In a disease, which offered so little hope in many instances, radical measures had always appealed to him as the most desirable to adopt, especially in view of the fact that less radical ones offered absolutely no hope, either in palliative or curative attempts.

The site of the ulceration was a very important point in determining the method to be followed. He was sure, we all saw ulcerations in certain situations of the larynx that went on from bad to worse, leaving the patient absolutely no hope of recovery. On the other hand, ulcerations situated in other portions of the larynx offered every opportunity. It had been his experience that in those cases in which the ulcerations attacked the epiglottis and aryepiglottic folds, or as pointed out by Bosworth many years ago, the nearer one came to the outer air, the less the possibility of cure. In these cases the results were less gratifying than when the ulceration was

situated deeply in the larynx, the ventricular bands, or the posterior commissure.

As to the existence of chronic laryngitis, he agreed with the author, that hygiene of the upper air passages, including the nose, pharynx, nose-pharynx and larynx was of great importance; not that these cases of chronic laryngitis in tubercular individuals would degenerate into tubercular laryngitis, but that there was a pathological condition of the upper air passages which afforded an excellent site for the development of tubercular lesions.

Dr. Solly, in closing the discussion, said they got a great many cases in Colorado that had not been treated along these lines. One of the chief difficulties was they had been treated too long and inefficiently, and when they came to them they were afraid of undergoing serious treatment. Patients had not been prepared for it, and one of the important things for physicians to learn was that when they got hold of a tubercular larynx to work hard to try and make the patient well. It was absolutely necessary that patients should learn to submit to any measures that were needful to accomplish that purpose. One should not take away hope, but tell patients they must have treatment.

Rest was very important. Opening the trachea was followed by a remarkable subsidence of the acute symptoms in many cases, and the patients sometimes lived for many years. Of course, this procedure was only admissible in extreme cases.

Dr. Brown referred to the use of lactic acid. Lactic acid even on an unbroken surface had usually good effect. As a rule, in these cases it was best to use the lactic acid well diluted, thus causing absorption through the mucous membrane, which was better than cauterization with the strong acid.

What Dr. Thompson said about early treatment was most important, and he thought it would be a great thing if the general practitioner realized the importance of getting his cases of laryngeal tuberculosis examined and treated by specialists as early as possible. People were frightened about their throats when they had chronic laryngitis, and when tubercular invasion had gone on for some time, it was not easy to tell what it was.

There were a great many points touched upon in connection with syphilis and tuberculosis, about the danger of stenosis, which Dr. Jackson spoke of, etc., but these did not come under the head of such cases as he had been referring to.

One of the reasons why the curette had fallen into much disrepute was because so much wholesale butchery had been committed with it in the past, particularly in using the double curette. Certainly tracheotomy was sometimes a very desirable procedure before proceeding to other methods.

He agreed with Dr. Levy that the locality of the disease largely determined the prognosis.

Dr. Joseph A. White, of Richmond, Va., read a paper entitled:

Mastoiditis.

The author reported a case of this disease, which was complicated by nephritis and erysipelas, at great length. The case presented some interesting points. First, the long continuance of the temperature changes. Second, the disappearance and recurrences of the suppuration. Third, the kidney complications, and especially the suppression of urine so long after the operation. Fourth, the development of erysipelas simulating sinus infection.

The author reported the case in great detail because some one else might have had a similar experience.

DISCUSSION:—Dr. H. Holbrook Curtis stated that in December of last year he had a similar case to that reported by Dr. White. The patient was a woman 62 years of age who had albumin with granular and hyaline casts in her urine before operation. She was operated on for mastoiditis in December. The operation was followed for four days by a temperature of 103-4 degrees, after which the temperature dropped, and on the eleventh day was normal. The patient was then attacked with erysipelas, with a temperature of 105 degrees. which lasted from the eleventh to the twenty-first day, after which time the erysipelas had entirely disappeared. As soon as the erysipelas had cleared up, she passed fifty ounces of urine. The next day, however, there was suppression, which lasted two days. Hypodermoclysis was resorted to under the breast on one side, and over the abdominal wall on the other. The day following hypodermoclysis, although the action of the kidneys had been reestablished, both areas of infiltration were erysipelatous, and she died four days afterwards.

Dr. R. C. Holmes reported the case of a boy, twelve years of age, who had been under observation for several months prior to coming to him. There had been made three Wilde incisions by those who previously had charge of the case.

When he saw him his face was slightly edematous, waxy in appearance, and the boy looked very sick. He was admitted to the hospital, and urinalysis showed the urine loaded with albumen, and contained large quantities of blood and casts. Looking into the history of the case, and conversing with the family physician, he elicited the statement that prior to an ordinary acute otitis media on the right side he was in perfect health, and that the albuminuria had developed in the course of the disease. He had been in the hands of a good man, but Dr. Holmes was informed that on account of the excessive albuminuria he did not desire to do the operation. The speaker, however, made the radical operation. The boy did splendidly. The anesthetic did not affect the kidneys, and he was progressing nicely. There was a slight diminution in the amount of albumen and blood. The wound was healing rapidly. Patient then developed a purulent otitis media on the opposite side, which necessitated opening the antrum (not doing the radical operation). The kidneys were so seriously involved that the boy finally died, although the ears up to a short time before death did quite well. Death was due to Bright's disease.

Dr. Edward B. Dench said, after listening to Dr. White's paper, that there were one or two points to be borne in mind. The urine should be examined previous to operation. It was his practice to do this in every case in which he thought it was going to be necessary to perform an operation, and in a number of instances (he could not say how many) brought into the hospital there had been some albuminuria, but that was not a contra-indication to operation in many cases. The action of the anesthetic might have had something to do with the albuminuria, and he had given chloroform rather than ether sometimes to prevent any congestion of the kidney in these cases.

The question as to whether a mastoid abscess could be secondary to a kidney lesion was rather far fetched. Of course, if one had a focus of pus in the kidney he might have a secondary mastoid abscess, the same as a secondary abscess in any other part of the body; but to consider the mastoiditis as dependent upon nephritis, except in a general way, was far fetched.

As regards the prognosis in cases in which albuminuria was present, he had never seen them do badly. It was true, convalescence might be prolonged, but he did not think these pa-

tients necessarily would do badly if they withstood the operation.

Some of the features in Dr. White's case were interesting, and he (Dr. White) probably struck the key-note of the trouble when he said that some of the cells in the mastoid might have been overlooked at the time of the first operation. Practitioners were very apt to overlook some of the cells lying in the zygomatic process. He had seen a number of cases in which the invasion of the zygomatic cells was started from pus, and in the deeper zygomatic process there were a few drops of pus. The same thing was true of the cells overlying the lateral sinus.

He had had erysipelas develop in quite a number of mastoid cases, one in private practice, and it had developed in hospital cases more than once. The patients, however, had invariably done well. He recalled one death from erysipelas occurring in a mastoid case. The curous part of it was that it did not seem to make much difference how extensive the wound in the mastoid had been or the exposure. In one case in particular, wher the sinus was exposed to the extent of an inch or more during operation, the man developed erysipelas. In his early practice he felt much worried that he would have to expose the sinus. This man developed streptococcus infection in his superficial structures, but recovered. So, after all, erysipelas in cases of mastoditis did not seem to be a very fatal complication.

Dr. Henry L. Myers said he had a case of acute mastoiditis in a young woman before coming to the meeting. She had suffered an attack of la grippe. She had a slight chill, some temperature, and developed earache. The earache lasted four days before she came to him, at which time he found it necessary to resort to paracentesis. The next morning, tenderness not having diminished, he opened the mastoid and found pus in the antrum and in the tip. The next morning she was doing well. The following day, however, she showed a great deal of jaundice, and vomited continually; temperature rose to 101 degrees, and she seemed a little dull in mind. The next day she was delirious; did not know any one; temperature 101 degrees; pulse 120. He examined her urine and found it full of albumen. Her family physician thinking perhaps she might have had some malaria beforehand, blood tests were made, but the plasmodia was not found. The leucocytes were 12,000 or 15,000. She was in this condition for 24 hours, then she began to clear up. All her symptoms passed away as rapidly

as they began. On the fourth day she was entirely herself, and her condition seemed to be normal. The question arose as to whether her urine was involved as a result of the mastoiditis, or whether she had previously had albumen in her urine. Personally, he was inclined to take the latter view. The possibility of a mild serous meningitis should also be considered.

Dr. Chas. W. Richardson said it was as necessary to find out the cause as the fact of invasion of the middle ear with mastoiditis. The administration of the anesthetic might have been sufficient to cause the disturbance in the kidney, for if the urine was examined in these cases shortly after these operations a high degree of infection of the kidney would be found.

With regard to erysipelas, he had seen it in probably half a dozen operated cases, and he had been interested in regard to the mode of infection. One of his assistants called his attention to it, and he thought the probable source of invasion was through the excessive scrubbing of the skin. He had noticed that the infection began about three inches or more from the seat of the wound, either in front or back, so that he was inclined to believe that infection took place through the excessive scrubbing of the skin in these cases. In the last year or so he had resorted to such thorough scraping of the skin with hair brushes that he had not had any infection. He had in the last year had three cases, had followed each one, and did not have a death from erysipelas. Erysipelas had not given him much concern. He had had it follow operations, but never infected the wound, and patients had all done well.

Dr. White, in closing the discussion, said that his paper was read for the purpose of eliciting discussion. He was very anxious to hear the experience of others, and to know if any etiological connection could be drawn between nephritis and mastoid disease. He had drawn no conclusions himself, but had simply offered suggestions for discussion. It seemed to him, however, it was perfectly sensible to conclude in the presence of nephritis that the course of mastoid disease must necessarily be more or less complicated or prolonged, with the possibility of a relapse and a long convalescence because the system was lowered in its vitality. The whole condition of the patient was reduced by nephritis. The ordinary normal resistance in pyogenic cases was impaired, and the healing process must naturally be delayed.

He thought Dr. Dench would have opened this sinus sooner

than he proposed to do it, but that was the difference between New York and Richmond. In New York they did not hesitate to operate in such cases with the slightest indication for it. He had to be more cautious in his community. He had suggested mastoid operations not once or twice, but a great many times when the operation had been declined, and in nearly every instance the patient got well without having the mastoid opened. In New York, in all probability, every one of these would have been operated on; in fact, the numbers operated on there seemed so large to him that he once asked Dr. Dench if they did not keep a breeding establishment for them. The fact that so many had declined the mastoid operation and gotten well without it convinced him that operation was performed in too many cases. For instance, the very patient above reported recovered without opening the sinus, and had been well for four months.

Dr. W. S. Bryant, of New York City, read a paper entitled:

Tinnitus Aurium, and its Treatment.

The author discussed local treatment only. This was found to be the same as the treatment for deafness with few exceptions. Many of these arose because the disturbance was of more delicate nature than that causing a loss of hearing alone. It, therefore, required still greater care in manipulation. Too energetic treatment might tend to increase rather than decrease the symptoms. In a large proportion of cases the sound conducting mechanism was at fault, and required treatment more than any other defect in the complicated condition which gave rise to the tinnitus. Neurectomy had been tried in cases of grave tinnitus, with unsatisfactory results, owing to the poor technique employed, and the selection of improper cases. Further attempts would undoubtedly develop a comparatively safe and sure method. Treatment in objective tinnitus was chiefly directed to lessening the sounds, and later to dulling the patient's perception of them. In subjective tinnitus the local treatment was chiefly directed to lessening the perception of the tinnitus by the ear, and the improvement of sound conduction; secondarily, to lessening the sounds themselves. Most of the tinnitus under this head was dependent upon pathological conditions of the mucous membrane of the Eustachian tube and tympanum, which were themselves dependent on like conditions in the naso-pharynx. The treatment was worked out on the

lines required by a classification of the varieties of tinnitus, which the author submitted.

Dr. William C. Bane said he presumed the author of the paper left out quite a good deal in reading it, as in speaking of the use of the galvanic current he did not mention the strength of the current. The speaker thought this was important.

Dr. C. R. Holmes said the subject was one of great importance. He was sorry the author was obliged to skip so much of his paper on account of the limitation of time. He should certainly look forward to reading the paper carefully when it was published.

Dr. Alfred B. Duel said, if he understood the essayist correctly, he stated that in cases in which tinnitus persisted, in spite of efforts to relieve it, he would advise operation for complete deafness. As a matter of fact, nearly all cases which were encountered that had chronic catarrhal deafness had marked tinnitus, which was never completely relieved. He would like to ask the author if it was his intention in all these cases to render the patient deaf by relieving the tinnitus, or in such cases in which the tinnitus was pronounced, did he expect the patients to become insane.

Dr. Bryant, in closing the discussion, said in regard to the remarks concerning the use of electricity, he used the galvanic current, and where one uses the larger electrode in the pharyngeal end of the tube, he could employ as much current as the patient would stand without any bad results.

In answer to Dr. Duel's question, he would like to say that in some cases in which the tinnitus was very severe he would not hesitate to recommend the radical removal of the auditory nerve. The idea was that in cases in which the noise was very great, disturbing the patient mentally, and where insanity was threatened, it was worth while to take any risk. In many cases the tinnitus might be only a slight inconvenience.

Symposium of Malignant Growths of the Upper Air Passages.

Dr. Frederick C. Cobb, of Boston, read a paper entitled:

Malignant Growths of the Nose and Naso-Pharynx.

The author referred to the several classes of malignant growths of the nose and naso-phyranx.

It was an interesting question whether benign growths might degenerate into malignant ones, as had been claimed. The

evidence was conflicting. No case had been found which distinctly proved such hypothesis.

Many of the sarcomata occurred in the young in whom polypi were very rare. Most of the members had undoubtedly removed the polypi from the same persons for many years in succession, and he could not find any cases of malignancy resulting in his own practice or his friends. From a clinical standpoint he believed that the presence of sarcoma and malignant growths had been an accident rather than a degeneration.

Sarcoma of the nose manifested itself usually in a dark red polypoid mass, bleeding easily when touched with the probe. The pedicle of this growth was broad and thick, while the texture of the polyp was soft and friable. Secretion, when ulceration sets in, might be purulent and often offensive, or there might be no odor and very little secretion.

The diagnosis of malignant growths of the nose might be divided into three classes:

1. Diagnosis between malignant or benignant.
2. Diagnosis between different forms of malignant disease.
3. Diagnosis of malignant from tubercular and syphilitic lesions.

The prognosis of malignant growths in the nose and nasopharynx was almost universally bad under all forms of treatment known at present.

As to treatment, removal by intra-nasal method as a palliative measure might be advised where some indication prevented operation by a more radical method. Where such method was resorted to the galvanic-cautery wire loop was probably the safest instrument, although the cold wire snare, if carefully and slowly used, might be recommended. The success attending major operations, such as excision of the jaw, was very far from encouraging, yet operation might be resorted to as a forlorn hope, or to relieve the urgency of some of the symptoms. There always remained a faint possibility of success, although the prognosis, even with the most radical operations was extremely doubtful. These tumors usually extended far deeper and higher in the nasal cavities than was supposed before operation, and any operation recommended should be the one giving access to the greatest extent of nasal tissue.

Where the growth was bilateral, Ollie's operation, which consisted in sawing through the nasal bones and turning the

nose forward upon the face, gave one a very clear view of the ethmoid region and upper portion of the nose.

No operation should be done without careful consideration as to whether the patient could stand the severe hemorrhage which was likely to result.

Dr. M. A. Goldstein, of St. Louis, Mo., followed with a paper entitled:

Malignant Growths of the Mouth and Pharynx.

The author spoke of the importance of early diagnosis, after which he illustrated the value of prompt operative interference by reporting an interesting case of epithelioma of the tongue.

He discussed the favorable conditions of the pharynx for the development of malignant neoplasms: also the organs involved, the character and frequency of the neoplasms, etc.

The differential diagnosis was discussed at great length.

With regard to therapy, he said there were but two courses of treatment open for consideration at the present time. First, the X-ray and radium treatment. Second, the radical operative removal.

The X-ray and radium therapy were still so much in the experimental stage, that definite results could not yet be recorded. If the brilliant possibilities for the use of such a therapy be realized and the numerous preliminary reports of remarkable improvements and cures could be substantiated, then the X-ray and radium light would offer an ideal solution of this grave problem. Until then we must content ourselves with radical excision and dissection of the involved tissues and of all adjacent structures which threatened metastasis.

Enucleation of a faucial tonsil alone even in the earliest possible stage of malignancy was not sufficient to safeguard the patient against recurrence. Radical surgery was indicated.

As to the prognosis, one should be encouraged by the records of the past two decades, all of which presented substantial evidence of the cure of a larger percentage of cases of malignant neoplasms in every portion of the body. This might properly be credited to the more radical forms of operation, and the greater proficiency in early recognition of cases.

Dr. D. Braden Kyle, of Philadelphia, Pa., gave a brief discussion on:

The Pathology of Malignant Growths of the Upper Air Passages.

Before proceeding to discuss the pathology of malignant tumors of the respiratory tract, the author desired to say a word or two in defense of the microscope. One of the members at a previous session spoke disparagingly of microscopic examinations, because of the different diagnoses received on specimens which he had submitted for examination. In the first place, a great deal of fault in diagnosis lay with the clinician, who might in a case of doubt simply remove a small piece of tissue and send it to the microscopist for examination. Now, if the microscopist was not also a clinician, the report would be faulty, for the clinical data should always be considered. One could not possibly by the microscope alone differentiate between a small round cell sarcoma, an acute inflammatory condition that was partially organized, an inflammatory area around a specific or tubercular lesion, and many other processes, simply by examining a few sections taken perhaps from a small area of the diseased tissue. He might write out exactly what he found, but deductions should be drawn only from thorough examination. The best microscopist was the man who was also a good clinician, who associated all phenomena observed in the patient with the microscopic findings, and on him we could rely. To condemn a miscroscopic examination because of the faults of some one who had misused it was unjust.

Malignant tumors of the upper respiratory tract were either sarcoma, the connective tissue type, or carcinoma, the epithelial type. The confusion which might at times result from the fact that we had certain benign tumors which became the seat of malignant growths might be thus explained. For instance, we might have a benign tumor of the connective tissue type or of the epithelial type, fibroma being an example of the former and a papilloma of the latter class. Take adenoma, for instance, which gave a reproduction of the gland structure; it fell short in one thing, and that was physiological function. This tissue was of low grade and through irritation predisposed to a malignant condition, whether it be carcinoma or sarcoma. Papilloma occurred at the junction of the skin and mucous membrane, or it might occur at the junction of a fold of mucous membrane. These locations, naturally subjected to irritation, would tend to produce carcinomatous or sarcomatous tissue. One would frequently see articles in medical journals in which a benign tumor was said to have become malignant.

It never became malignant because a benign tumor was never turned into a malignant one any more than typhoid fever turned into pneumonia, although one might predispose to the other. A benign tumor at a point where it was subjected to irritation would more likely be the seat of malignant growth than if there were no tumor there, but the embryonic cells must necessarily have been there to begin with.

About the pharynx, the nasal orifice, the tonsils, the tongue, the mouth, where there were benign growths, a great many practitioners say remove them at once, and possibly in many cases this was the right thing to do, because irritation of the tumor might tend to its malignancy. He urged upon all, in the microscopic examination of tissue, to consider the early history and present clinical appearance of cases, and wherever there was breaking down of tissue, whether it be a benign growth, or one which from irritation has become the seat of malignancy, to take into consideration the advisability of its early removal from the mucous membrane.

Dr. Chevalier Jackson, of Pittsburg, Pa., read a paper on:

Malignant Disease of the Upper Air Passages.

The author said that the factors in the etiology of carcinoma were age, sex, heredity, syphilis, irritation, and precancerous benign neoplasms. The sites in the order of frequency were the glottic boundaries, the epiglottis, posterior surface of the cricoid cartilage, interarytenoid fold, aryepiglottic ligament, ventricular bands, the ventricle, and the infraglottic region. The symptoms were dysphonia, hoarseness, aphonia, cough, expectoration of frothy secretion, dyspnea, hemorrhage, orthopnea, pain, laryngeal, and referred to the ears, dysphagia, odynphagia, fetor, and cachexia. The laryngoscopic appearances might show paralysis of a cord, a more or less diffuse redness, or a protrusion appearing snow white, dirty gray, pinkish, or reddish, in form, papillomatous, warty, with sharply pointed elevations, with intervening rounded granulations, or ulcer. It might be single or multiple, and was often covered with pus or frothy saliva. The diagnosis would rest upon the age, fetor, cachexia, adenopathy, pain, duration, paralysis of a cord, palpitation of the thyroid cartilage, and the microscopic report. Syphilis, perichondritis, lupus, tuberculosis, chronic laryngitis, blood clots and hemorrhage spots, pachydermia, eversion of the ventricle, and benign growths were excluded. The prognosis as to termination was unfavorable, but not hope-

less. In early operated intrinsic malignant disease it was good. In disease extrinsic by origin or extension, and when the lymphatics were infected, it was unfavorable. Prognosis as to duration, from two to ten years might be promised, if not seen too late. As to recurrence, the prognosis was the same as mentioned of termination. The prognosis as to voice in early thyrotomized intrinsic cases was fairly good; in late cases requiring laryngectomy, some kind of sound answering to speech might be promised. Treatment might be palliative or radical. Palliative measures included tracheotomy, esphagostomy (or gastroenterostomy), cleansing sprays, and gargles. Serum therapy, Finsen's light rays, Roentgen rays, and radioactive substances were not yet proved of benefit. Partial endolaryngeal removal of the malignant mass was absolutely unjustifiable, even for the dyspnea, unless consent to a tracheotomy could not be obtained.

RADICAL TREATMENT.—Unless a total removal of infection was a reasonable possibility, no operation was justifiable except tracheotomy, esophagotomy or whatever else might be planned to prevent or postpone inanition or asphyxia. Radical endolaryngeal extirpation was impossible. Radical measures included transhyoid and infrahyoid pharyngotomy, thyrotomy, partial laryngectomy, and total laryngectomy. Pharyngotomy, transhyoid and subhyoid were adapted only to disease limited to the epiglottis. Thyrotomy was the operation of election under the following conditions: 1. An intrinsic growth. 2. A limited extent of disease. 3. Malignancy. 4. Suspected malignancy (exploratory thyrotomy). 5. No involvement of the thyroid cartilages. 6. No glandular involvement. Partial laryngectomy was advisable when at thyrotomy removable malignant extension was found. Total laryngectomy, with if necessary removal of all infected glands and tissues, was indicated when the patient desired a chance of cure, with, in any event, increased comfort for a variable period, when the disease was extrinsic by origin or extension, or, though intrinsic, so extensive that sufficient surrounding healthy tissue could not be otherwise removed. Total laryngectomy with modern technique, prosthetic appliances, and the possibilities of buccal voice, was not the formidable prospect for the patient that it formerly was. Preliminary stitching of the trachea to a button-hole in the skin, the avoidance of opiates, the combined Trendelenburg-Rose position, "talking anesthesia" with chloroform, allowing the patient to "come out" before the stitches

were put in, careful postoperative watching, very frequent cleansing of the canula, and keeping the patient prone after operation, all these would reduce the danger of postoperative pneumonia to almost nothing. Rectal alimentation was a delusion and a snare. Feeding should be by esophageal tube for a few days. The use of a brilliant head-lamp facilitated thorough extirpation. The curette had no place in the extirpation of laryngeal malignant disease. It rubbed in the infection, as a rake buried seed in the soil. A clean cut with knife and scissors through healthy tissue beyond the invaded area was the best method.

DISCUSSION:—Dr. A. Logan Turner was asked to open the discussion. He said he had very little to say on the subject. It was a wide one and was open to a great deal of discussion. The discussion of malignant growths of the larynx alone would consume much time. Dr. Jackson, of course, was obliged to condense his paper in giving it, and there were many points which he was not able to put before the members. The speaker was more interested in Dr. Jackson's part of the subject because he wanted to hear what views were held on this side of the ocean with regard to the methods of operating on malignant diseases of the larynx. In England the general trend of thought and action was towards the views of Sir Felix Semon and Butlin, namely, to resort to thyrotomy in intrinsic laryngeal cancer. If his reading was correct, on this side of the ocean the tendency was towards a wider removal of the disease, and that laryngectomy was indicated and carried out more frequently, and, lastly, the operation of thyrotomy. The whole secret depended on early diagnosis, and unless one could diagnose cases of cancer of the larynx early, he could not do modified operations. He wished he had brought with him the latest statistics of Semon and Butlin on this point, but unfortunately he was unable to get them before leaving home.

Dr. C. R. Holmes said there was one point that impressed him very forcibly, and that was, from his own experience he had learned that the microscope was not always to be relied on. He thought we were all apt to cut out a piece of tissue and submit it to some one who professed to do microscopic work, and that this individual to whom the section was sent frequently gave an opinion that did not correspond with the clinical diagnosis and clinical results. This had been his experience. He had in mind one typical case, that of a promi-

nent business man in Cincinnati, who came to him, as a last resort, for consultation. He had been advised, after prolonged observation and treatment by a good man, to have his superior maxilla on the right side removed for a malignant growth. Upon examination the speaker was not convinced that the trouble was malignant. However, he removed a piece of the growth, sent it to a microscopist, and received a report that it was sarcoma. He doubted the correctness of this report. The man was about to be married. He denied a specific history. He believed the trouble to be specific, and put the man on antisyphilitic treatment, and today he was perfectly well. This case was seen several years ago. The disease melted down promptly under antisyphilitic treatment.

In the case of a woman, about 35 years of age, a diagnosis was made of cancer of the larynx, involving the tonsils and base of the tongue. Surgeons were consulted, who advised the splitting of the jaw to remove a part of the larynx. Microscopical sections were submitted to two or three microscopists, and the disease pronounced malignant. Some said we might as well let the woman die. She was rather frail in physique. The speaker resorted to G. Betton Massey's method of electrolysis, and the case was now apparently well. There were still small remnants of the growth, but it had been reduced nine-tenths in size. Whether the findings of the microscopists were right or wrong, he was still in doubt. Had he followed the dictates of the microscopists, a radical operation would have been made at that time. He saw this woman only a short time ago, and seemingly she was perfectly well, although it was about five years since he first treated her.

He thought Dr. Jackson took too firm a stand against nutrient enemata. Last year his mother, aged 74, died of obstruction from cancer of the stomach. She received absolutely nothing but nutrient enemata for over two and a half months. She would have the sensation of hunger at hours when the enema was due and it appeared practically as satisfying to her as an ordinary meal. She was well nourished, and continued so almost to the last, but there was such absolute occlusion that not a drop of water would pass through the stomach, and it was from thirst and finally general exhaustion, but not especially from lack of nutrition, that she died. He did not think one should take such a strong view against the efficacy of nutrient enemata as Dr. Jackson had done.

Orbital Infection from the Ethmoid Cells, with Spontaneous Opening at the Inner Angle of the Orbit.

Dr. Carl E. Munger, of New York City, said, in studying the literature of orbital abscesses involving the ethmoid region, it was apparent to him that the number of cases recently reported was much less since the rhinologist had been developed, and our knowledge of intranasal diseases had increased and intranasal surgery had become more nearly perfected. This was undoubtedly due to the earlier diagnosis made possible by more extended information as to ethmoid diseases, and the greater promptness with which the ethmoid region was attacked surgically. Cases of orbital infection from the ethmoid cells occurred, as was evidenced by the report of such cases. Most of the examples of this occurrence were chronic in character, coming on early after a long duration of ethmoid trouble, but with notable exceptions, *i. e.*, as in a case reported by W. N. Hubbard, in which the orbital abscess came on shortly after a case of tonsilitis, probably of influenzic origin in a patient with no previous history of ethmoid involvement; and a case reported by Milligan, where an ethmoiditis followed a severe attack of cold in the head, and this in a short time followed by the appearance of an orbital swelling in the region of the inner canthus. The case reported by the essayist was not unlike those previously reported.

Discussion:—Dr. Knapp thought the subject of orbital infection secondary to ethmoid disease was very important, as it was one of the most frequent complications of ethmoid disease, and as far as he had been able to judge these complications could be divided into two classes. In the first class there was no perforation of the bony wall, while in the second class there was perforation of the bony wall. In the first class, usually cases of acute ethmoiditis, he had seen collateral edema of the orbit producing exophthalmos, with congestion of the eyebrows. In this class the symptoms were relieved by intranasal treatment of the ethmoiditis. The second class of cases, in which there was perforation, could be divided into the acute and chronic. The acute cases led to the formation of abscess which tended to perforate anteriorly, as in the case just reported. In the chronic cases an enormous abscess sac developed between the periosteum and the ethmoid labyrinth. The most serious complication he had seen following this had been sudden and complete blindness of the eye on the affected side, the ophthalmoscopic picture simulating that of embolism

of the central retinal vessels, and the only way it could be explained was that it was an acute arteritis of the retinal vessels in the form of embolism.

The treatment in the cases he had seen in which perforation had occurred, either in the acute or chronic form, had been a little more radical than that described by Dr. Munger. He did not think drainage alone was sufficient treatment for these cases because we were liable to have a relapse. A radical operation was indicated in most of them.

Dr. J. A. Thompson said that a confusing point in the diagnosis of these chronic cases was illustrated by a patient he saw four years ago in consultation with an oculist. He was asked to examine the patient after preparations had been made for the removal of an orbital tumor. The history was that when a child, three years of age, he had a severe case of scarlatina. From that time until he saw him, nineteen years later, he had never breathed through the corresponding nostril. But no attention had been paid to this. The patient lived on a farm out in the country. When the ocular symptoms developed, he was brought to the hospital in the city and placed under the care of a colleague. The morning the speaker saw him the left eye was at an angle of 45 degrees. There was some conjunctivitis; some weeping from the corresponding eye, but no active inflammatory symptoms. Pressure over and around the orbit elicited a little expression of pain, and the feeling was that of a bony tumor. He was utterly unable in the nasal examination to pass a probe through the nose back to the naso-pharynx in any portion of it. There was some adhesion between the septum and structures of the outer wall, and no amount of cocaine or adrenalin could enable him to find the opening. He told the oculist who had the case in charge that he thought it was one of ethmoid abscess that had pushed the orbital plate of the ethmoid in front of it. Arrangements had been made for operation. He went ahead and made a free opening into the nose. He found, when he entered the orbit, he was unable to get any pus until he perforated the bone, and then the discharge was free. The after results were a troublesome part of his operation. The operation wound would not close, and some two months later the case was brought to the speaker for intranasal operation, with the hope of getting the fistulous opening at the upper part of the orbit closed. He never undertook so hopeless a job. There was absolutely no landmark by which one could recognize the

normal structures. All he could do was to go in and remove granulation tissue, with spicules of bone lying in it. To make a long story short, he made three operations before he succeeded in getting the nostril patulous, and in securing a perfect cure. The eye returned to its normal condition, and the young man was able to breathe through the nostril, although there was an adhesion at one point.

Dr. T. Passmore Berens thought the treatment of these cases could be summed up in three words—radical but careful. Unless one was radical in the removal of the ethmoid cells, the case would continue to suppurate, and one would get a condition described by Dr. Thompson.

Dr. Munger, in closing the discussion, said he had nothing to say except to remark that a radical operation in some of these cases was necessary. He did not think, however, it was indicated in his case. The patient got well, so that he saw no further occasion for operating.

Adenocarcinoma Occupying all of the Sinuses, Nose and Orbits.

Dr. W. H. Dudley, of Easton, Pa., read a paper on this subject, and presented a pathological specimen. The patient was 63 years old, with a history of the previous removal of palypi from nose and nasopharynx, and presented himself with disease of left maxillary antrum, and exophthalmos. Antrum and orbit were cleaned out, but growth soon returned, and continued to involve one sinus after another, until the whole anterior portion of the head had become one mass of adenocarcinomatous tissue. Microscopic sections of polypi removed early were simple adenoma, but all sections examined after the operation to relieve the exophthalmos were adenocarcinoma. The case was under observation over two years, and during this time the Rontgen ray was used for several months, which resulted in relieving the pain (which was never very severe), and reduced somewhat the size of the tumor, which, however, grew rapidly as soon as this treatment was discontinued. An examination of the bisected specimen showed practically none of the osseous framework of this part of the head, except the sphenoid and frontal bones, and a portion of these was also absorbed. Several photographs were presented, showing the appearance of the case at different stages of the disease.

Dr. Arthur B. Duel, of New York City, read a paper in which he reported:

Cases Illustrating Difficulties in the Diagnosis of Mastoid Complications.

Ordinarily extension of a suppurative process from the mastoid to the adjacent structures is accompanied by unmistakable symptoms. Even though all the typical symptoms are not present, the surgeon is led to operate in an exploratory way early rather than hesitate, the exploration of surrounding structures not being difficult with mastoid cells removed. The author presented three cases to ilustrate the difficulty arising when a concomitant disease is present or developing, in determining whether changes of temperature, pulse, respiration, and alteration in blood are due to aural extensions or other remote causes. In one case, the chart and general aspect pointing to a developing sinus trouble, a diagnosis of pneumonia was made by the consultants; the patient recovered with the diagnosis left in doubt. In the second case, indefinite chest signs developed directly after the operation; a distinct broncho-pneumonia had been present prior to the mastoiditis; in spite of the picture being unlike that of a sinus thrombosis, the author removed a diseased sinus and jugular—being inclined to explore by the fact that they could not find sufficient signs in the lungs to account for the temperature.

The third case, a child, was operated on for a cervical adenitis complicating an apparent catarrhal otitis. During the ten days following, the temperature remained on the 100 line, when a post-aural swelling appeared. A mastoid was performed, and patient made an uneventful recovery.

Dr. Jas. F. McCaw, of Waterbury, Conn., read a paper on:

Mastoiditis.

He cited four interesting cases of this disease. The first was one of acute suppurative otitis media, mastoiditis, subperiosteal mastoid abscess, peri-sinus epidural abscess, which was operated on, with recovery. The second was one of acute suppurative otitis media, double mastoiditis; operation and recovery. The third was one of acute suppurative otitis media, mastoiditis; operation and recovery. The fourth, acute suppurative otitis media, mastoiditis, epidural abscess; operation and death.

Diseases of the Salivary Ducts and Glands and their Treatment.

Dr. Robt. C. Myles, of New York City, pointed out the dis-

eases commonly associated with these organs, and reported five instructive cases. The points of interest that were taught by the histories of these cases were:

1. That it was necessary to make a thorough test of every known method, in order to make a correct diagnosis in a suspicious case.

2. That the removal of these calculi could best be accomplished by surgical procedures, preferably through the floor of the mouth.

3. That it was always well, when possible, to probe and dilate the duct, and thus establish and maintain the normal flow of the salivary secretion.

DISCUSSION:—Dr. Geo. L. Richards had had two cases. A man, a fish dealer, had an intermittent discharge from the right side of the mouth through the sublingual duct for some time, which became purulent and sero-purulent, after which swelling occurred, with involvement of the sub-maxillary gland. Patient stated to his physician that some years ago he stuck a piece of straw into the duct while cleaning his teeth. Everybody laughed at him as no calculus could be felt. The condition of the patient became so serious and the swelling so great, that Dr. Richards finally dissected out the submaxillary gland and in getting into the anterior part of the gland found a good sized calculus, and after sawing through the calculus found the offending straw. This was the nucleus around which the entire trouble originated. The removal of the calculus was followed by an entire cure. He never heard the patient say anything in regard to the very annoying lack of moisture in that side of the face. He asked Dr. Myles if the parotid still remained on that side, whether there would still be insufficient moisture of the mouth.

Dr. Myles thought the man might have been depressed from long treatment and the dryness under the tongue might have affected him.

Dr. Richards said that in the other case, in which there was swelling of the tongue, on probing he did not find any calculus, but on slitting the parts up along the line of a small director, and going about an inch and a half downward, he found a calculus, removed it, and healing occurred.

Uses of Rubber in the Treatment of Nasal and Antral Diseases.

Dr. Price Brown, of Toronto, Ont., said there were many cases of nasal disease in which, although the passages might

be sufficiently open to permit of nasal respiration, yet owing to accumulation of secretion while sleeping, the mouth dropped open, and oral respiration was the result. In consequence of this, the dry air entering the pharynx absorbed the moisture exuded by the superficial glands for the lubrication of the mucous membrane, and chronic pharyngitis and laryngitis were the results. For the last twelve years the author had endeavored to remove this cause of oral respiration by the use of rubber mouth pieces, made of pure sheet rubber, about an eighth or a twelfth inch thick. A piece was cut to fit the cavity of the mouth between the teeth and lips. The latter were closed over it, hiding it from view, and when worn, oral respiration became impossible, the patient being forced to breathe through the nostrils. One great advantage of all these rubber appliances was that they could be easily made by the surgeon.

DISCUSSION:—Dr. Geo. L. Richards said, in regard to the treatment of antral empyema, he failed to see why one should drain through the mouth when he could do so underneath the inferior turbinal in these cases. In the cases spoken of by Dr. Brown, one could make an exploratory incision underneath the anterior end of the inferior turbinal; he could enlarge this with various sized curettes, and then take the second size of Dr. Myles' forceps, and get a space of three-quarters of an inch, which would not close, and which would drain the antrum into the nose. By so doing, the patient was not subjected to the annoyance of a band of rubber against the teeth. He had found that this method gave rapid and permanent results.

Dr. Robt. C. Myles stated that for ten or fifteen years he had experimented with these different processes. He published several cuts of soft rubber tubes which he used for quite a while, but as time went on he found better methods. He had patients who for ten or twenty years had suffered from post-nasal catarrh, and they would never permit their antra to be closed up again. He had a patient who, for the last six or eight months, had washed out his antrum and continued to do so every time he washed his face. If one could get free drainage and free admission of air, in many cases the antral conditions would get well of themselves without too much surgery.

Dr. James E. Logan said, in regard to the rubber splint that Dr. Brown used in the operation for deflection of the nasal

septum, it had been his practice to discontinue the use of any rubber (vulcanite) tube or apparatus upon the septum, for the reason he found in these operations, when one corrected the deflection of the septum by whatever means he adopted, the natural inclination in the healing process was for the septum to return to its otherwise deflected position. Constant pressure was needed, more or less, and for that purpose he used a modified plug. If the plug was pressed, or a modification of the Simpson plug fitted the aperture which one wished to mould, the use of this compressed plug exercises constant pressure which brought about success. It was much better than the use of something which was not so elastic, and caused nothing in the way of counterpressure which was exerted by the hard rubber or metallic splint.

Dr. Price Brown, in closing the discussion, said that he did not wish to emphasize this method of treatment above all others. As stated, the case he had was that of an old man too much debilitated to justify him in undertaking a more radical operation, and he thought the treatment he carried out was simpler. In all probability, one might have had more effective drainage by other means in the case he reported, but he did not expect his patient to recover, and succeeded in putting in a tube very easily for washing out purposes. The method of treatment was unusual and the result a cure.

With regard to the use of the splint, the benefit of it came from the constant pressure it produced. The reason Dr. Logan did not receive benefit from it in his cases was because he did not use it long enough. It did no injury. It produced no sepsis. It loosened because the septum became rigid and shrank back from the splint. The septum, so far as his own case was concerned, remained in position without changing. The use of the splint was much better than the other methods he had tried.

Dr. Edward B. Dench, of New York City, read a paper in which he reported a case of acute suppurative otitis media, which was complicated by a double pneumonia and septic thrombosis of the jugular bulb. The author resorted to excision of the internal jugular, which was followed by general systematic infection and death.

Discussion:—Dr. Kasper Pischel, of San Francisco, asked what Dr. Dench's experience had been with anti-streptococcus serum in the treatment of these cases.

Dr. Dench replied that this was the only case in which he

had ever used the serum, and the result was not very good.

Collodium After Nose Operations.

Dr. Kasper Pischel, of San Francisco, gave a demonstration of the use of this agent, after which he stated that two years ago he published an article on this subject. At the meetings of the German Pathological Society and the London Largyngological Society last year, the question of the operative treatment of the nose was discussed, but the method which he suggested was not mentioned. He thought it was an oversight, as such things must be seen in order for one to appreciate their value.

The after treatment in nose operations, on the septum as well as on the turbinals, had been quite unsatisfactory to him. There was the alternative to pack the nose or take the risk of having a severe hemorrhage. To have the nose packed was very disagreeable to the patient. If the packing was loose, one might have a hemorrhage. If the packing was tight, it sometimes caused such discomfort and pain that patients could not sleep. He tried different kinds of packing. Iodoform gauze strips soaked in ferro-pyrine solution answered tolerably well. A surer packing against post-operative hemorrhages was compressed cotton in the form of Dr. Simpson's intranasal tampons, made by Johnson & Johnson. The moisture of the nose made them swell up so that they very effectually prevented hemorrhage, but the pressure was sometimes so great that it caused pain, discomfort, and a sleepless night. The removal of the plug also was quite painful, and several times he overlooked some layers which were pressed into the cleft; they stayed there several days, causing some infection through the retention of pus. These disagreeable experiences caused him to look for a cover of the wound which would not close up the nares. He tried carbolized gelatine in 50 per cent solution, which had served him well in small hemorrhages of the septum, but it did not prove strong enough. For the last ten months he had used collodium, to his entire satisfaction. After he was through with the operation (removal of hypertrophy on the lower turbinal, for example), he touched the wound several times with adrenalin to stop the bleeding; then he dropped collodium on the wound, while his assistant blew compressed air into the nose to quicken evaporation. The collodium quickly formed a white, firm membrane which fulfilled two purposes. It covered the wound against infection from

the air and prevented secondary hemorrhages. As an extra precaution, he asked the patient to keep a little cotton in the entrance of the nose on the way home, but allowed him to take it out at home, so that he might breathe through that nostril. In several cases, to facilitate the sticking and to increase the power of collodium, he put a wisp of cotton on the wound first; after a few days he removed this membrane, which, if left too long, might cause infection by retention. He had now used collodium in thirty-one cases, and had not yet had one secondary hemorrhage. At first he was afraid that collodium would smart too much, but as the nose was under cocaine anesthesia the patient did not feel anything. The collodium must be dropped on the wound slowly and carefully, so that it will not run down into the pharynx, which would make the patient gag and cough. For dropping the collodium on the wound one might use a fine eustachian catheter, on the wider end of which a small rubber bulb (of a dropper) was mounted, fastened air-tight with a rubber band. One filling of the bulb with collodium was usually enough to cover the whole wound. He used a small metal tube, 9 cm. long, 1 mm. thick, with a tulip tip on one end, to fasten the rubber bulb. This tube had to be cleaned out thoroughly after use.

Discussion:—Dr. Chevalier Jackson, in the discussion, said he thought this was a most excellent procedure. He had seen Dr. Day use a similar method for years without a dropper, but this was a technical improvement on that method. After drying it off, he saturated a pledget of cotton with collodium and put it in with forceps, and left it in three, four or five days until it loosened itself and came away of its own accord. Secretions did not seem to penetrate it, nor to rot in it.

Dr. Joseph C. Beck asked if any gentleman had ever used glutol after operations on the nose. If any of the members would try it, they would find its fixity almost as firm as mouldine, and it was aseptic. General surgeons used it on laparotomy wounds, and had left them undisturbed. The wound was as clean as could be. Glutol dried out the surface, and that was what they used it for. There was no odor accompanying it. It was better than bismuth or any of the agents usually employed, and it would soak by means of a very warm solution. If one had to loosen it up and use considerable heat in so doing, he might start oozing. He had used glutol with satisfaction. He applied it with an applicator. He moistened the applicator, removed the excess, and the glutol was dried

sufficiently to make a coating over the surface. If the surface was far enough anteriorly, one could use a blower.

The Relation of Diseases of the Stomach to Affections of the Mouth, Nose and Throat.

Dr. Robert Levy, of Denver, Colo., in a paper with this title said that a careful review of laryngological literature impressed one with the fact that while there existed a relation between diseases of the upper air passages and those of the stomach, this relationship was not well defined, nor was the interdependence of diseases of the stomach and those of the mouth, throat and nose separated distinctly from affections of the gastro-intestinal tract, and, in fact, from those of the entire digestive system. Many diseases of the mouth, nose and pharynx and accessory cavities resisted treatment directed purely to the relief of the local conditions until measures intended to correct general disorders were instituted. Three positive statements might be made clinically:

1. That certain affections of the upper air passages and their adjacent cavities were causative in a measure of some form of stomach disturbance.

2. That certain stomach disturbances were the cause of certain affections of the upper air tract.

3. That the relationship existing between digestive disturbances and certain diseases of the upper air passages was so close that treatment must necessarily involve attention to both conditions.

Although no direct causative relation could be traced between diseases of the alimentary canal and certain affections of the mouth, they might be and frequently were associated. Among the diseases of the nose, which were more especially associated with gastro-intestinal affections were vaso-motor rhinitis, nasal irritation and red nose.

Urticaria of the mucous membrance of the throat was a serious and might possibly be a fatal affection, and was largely dependent upon digestive disturbances, as was well known to be the case in urticaria of the skin. Among diseases of the larynx, certain nervous affections, such as hyperesthesia and laryngeal spasm, were found attended with disturbed digestion. Although diseases of the stomach could not be said to be indisputably caused by affections of the mouth, nose and throat, or indisputably the result of diseases of these organs, the correlation was so close that successful management of

both depended largely upon recognition of this interdependence. This still further emphasized the thought, to which men working in special lines had called attention, that the entire human organism was one intricate mechanism in which local disorders were frequently but manifestations of constitutional affections.

Discussion.—Dr. J. A. Stucky was very much interested in the relation of naso-pharyngeal disturbances to gastro-intestinal trouble. Undoubtedly, the gastra-intestinal canal had a good deal to do with the nose and throat. Cases of so-called vasomotor rhinitis and of lithemic naso-pharyngitis, he believed, in a measure, had their origin in the intestinal canal, and in the last two years he had been making some observations in connection with a stomach specialist and microscopist, and found those patients that were sneezing, blowing, hawking and spitting lived a rather indolent life. Most of them were big eaters, great brain workers or society people, who had the handkerchief habit, who complained of rheumatism, general malaise, and were neurotics generally. In these patients he found the urine loaded with indican. His attention was first called to this by Dr. J. McClymonds, and in 123 examinations of the urine in cases such as he had described and read about at the Pittsburg meeting, he found an excess of indican in the urine; occasionally an excess of uric acid, but the uric acid found did not cause as much of the irritation as the presence of indican. He did not know anything about indican. It was said to be the result of absorption of the intestinal contents connected with fecal matter; but he did not know this. The moment he eliminated all of the indican, the moment he got his patient's colon flushed out and the diet regulated, the sneezing and nasal disturbance stopped. Personally ,he did not believe that the swallowing of the mucus secreted by the nose and throat had much to do with gastric disturbance, but the trouble began, not in the stomach so much as in the intestinal canal, and one had to clean out the intestinal canal and get the eliminative organs working harmoniously before these patients could be relieved. If they were sent to the country they got better. And why? For two reasons: Send them to the springs, and they would drink a great deal more water than they would at home. They would take a great deal more exercise than they would at home. They went there for a purpose. They did not take as much exercise and drink as much water at home as they did at health resorts. If they did, many of them would do just as

well at home as they would at these resorts. However, the drinking of fluids did not relieve the average case, and not until the alimentary canal was thoroughly emptied at both ends were they relieved. He meant by that high enema, using a thirty or forty-inch tube, the enema being given say at five o'clock in the evening, and then two or three hours later the same colon tube was used and 8 ounces of olive oil was injected. With this treatment the patient would go to sleep. If it was nine or ten o'clock, the oil was not passed until the next morning, and frequently not then unless a saline was given.

But about the second or third day one would be surprised at the enormous quantity of fecal matter that would be passed, large scybalous masses being passed, with foul odor. He did not succeed in thoroughly clearing out the intestinal canal in one case until the eighteenth day, but usually about the third, fourth, seventh or eighth day these cases began to clear up. The relief was marked. The objection to this treatment was that it required a trained nurse to give the injections properly. These patients were sent to the hospital to remain there for four or five days, if necessary, or else they were to have a trained nurse go to their home. The results of this treatment had been so beneficial and relief so great to the patients that they did not object to the treatment.

Dr. Frederic C. Cobb said his own experience agreed with what Dr. Stucky had said. There were a number of naso-pharyngeal cases which seemed to be entirely dependent upon digestive disturbances; but the complications which occurred in digestive disorders were far beyond anything one could find out without special study. He had often referred these cases to a stomach specialist, and the results obtained had been much better than if he had tried to treat them himself. Cases that did not yield to cauterization and clearing of the nasal cavities very thoroughly showed a startling improvement as soon as attention was given to the gastro-intestinal tract. These cases in his experience usually had gastro-intestinal symptoms, such as dyspepsia, diarrhea, constipation, etc., and unless treatment was directed to the stomach and intestines, as well as to the local conditions, the results were not satisfactory.

Dr. Wm. L. Ballenger saw a case some years ago which illustrated one of the diseases Dr. Levy mentioned in his paper as being due to stomach disturbance, namely, acute circumscribed edema of the pharynx and larynx and of the fauces.

A young lady, living north of his place some miles, started

for the city to attend a theater. When she left home she complained of slight headache. Before she had traveled more than four miles by train she began to feel a sense of suffocation, and she came to him on account of her acute symptoms of suffocation. Upon examination he found the fauces, uvula, and large portions of the lateral walls of the pharynx and epiglottis very edematous, apparently large urticarial wheels or edematous areas being present. Dyspnea was very marked. Cyanosis was somewhat noticeable; her mental distress was extreme. The first thing he did was to assure her that she was not in danger, and that if she remained calm she would soon get her breath again, and any danger would disappear. He then proceeded to scarify the edematous areas and apply astringent remedies, such as he happened to have at home, and among them he used cocaine. In a few minutes she was greatly relieved, and in a few days the edema had entirely disappeared. There was also very marked nasal disease in this case in the way of septal deformities and turbinal enlargements. Furthermore, the young lady was intensely neurotic. The affection might not have been stomach in origin, although this was quite probable, as her family physician, an able man, so diagnosed her case. He recognized urticaria in other parts of the body as being suggestive, having its origin in the digestive tract or faulty digestion, or faulty metabolism, and in this case it was quite probable it was the principal cause of the digestive disturbance. Patient had eaten largely of strawberries some hours previous to the attack. She had subsequently slight attacks of edema. He reported this case to the Chicago Academy of Medicine several years ago. His thesis for Fellowship in the Academy was based on this case. He described the case as one of acute circumscribed edema of the fauces and throat.

In general, he believed there was a close relationship in many cases between pharyngeal disease and the hyperesthetic types of rhinitis and diseases of the gastro-intestinal tract. He recognized, however, the great difficulty in establishing positive evidence to prove this relationship. Conclusions had to be based chiefly upon data rather than on any positive proof. If one would read Frederick's review of this subject, he would find that his conclusions were to that effect, that while there was a large amount of literature being written on the subject, there was little positive evidence existing to show such relationship. Clinically, however, it was very well established that there was such a relationship and it was interdependent. Some cases of

stomach disturbance were undoubtedly due to nasal or throat disease, whereas in other cases the nasal or throat disease could be ascribed to intestinal diseases.

Dr. J. A. Stucky added a word or two to what he had already said with the permission of the Society. He feared that he did not make himself clear in his previous remarks. Undoubtedly in some of these cases the urticaria was due to gastric irritation. But there was one experiment he had made on four or five cases that proved something, he thought. Dr. McClymonds, a stomach specialist in Lexington, had washed out the stomach in these cases, and in many of them it was not followed by relief, as the sneezing and irritation had continued. But the moment the alimentary canal was washed out relief was afforded. He thought this proved something. One patient he had, if she drank a cup of coffee and ate a plate of ice cream, within an hour or two she had a stuffy headache, sneezing, and an asthmatic cough. On three different occasions he had had her stomach washed out to see whether the trouble was there within two hours after eating, and he found coffee and ice cream. Then a high enema was given; the lower bowel washed out, a saline administered, all of which consumed an hour. The case was perfectly relieved. In four or five other cases he had tried the same experiment with good results. His observation had been that toxemia resulted from the absorption of the bi-products from the intestinal canal, and not from the stomach.

PROCEEDINGS OF THE FRENCH SOCIETY OF OTOLOGY, LARYNGOLOGY AND RHINOLOGY

MEETING OF 1904.

(Continued from the June Annals.)

Fronto-Maxillary Sinusitis with Anomaly of the Frontal Sinus.

DELIES (Ypres).—Mlle P. suffered several months with left frontal headache with an intercurrence of painful attacks accompanied by neuralgic irradiations from the eye and left upper teeth. The patient had frontal and maxillary sinusitis. Mahu's sign showed the capacity of the maxillary sinus to be 1¾ c. c.

Operation.—Trepanation of the frontal immediately above the orbital arch in the angle made by its internal border and the median line. I came upon a completely eburnated bone which I succeeded in penetrating after digging for one centimeter. No liquid escaped. At the bottom of the wound was exposed a more or less smooth, bluish, depressable membrane, permitting easy detachment without loss of blood or fluid from the internal table.

I made a second perforation in the bone immediately above and outside the first, and with the gouge brought the two openings into communication. I then had under my eyes the same membrane, glistening and elastic, described above; it had no pulsating movement. I was convinced that it was the dura mater. A blunt probe introduced in all directions penetrated easily between the bone and this membrane, being nowhere arrested save at 1½ m. m. in the direction of the median line. No long resistance was met anywhere.

Below and behind it easily entered several centimeters without penetrating into the nose. To be absolutely sure that I was not in the sinus I punctured the membrane with the point of a knife. An aqueous fluid escaped and pulsation instantly appeared at the incised point. Before going further I protected the dura mater with a tampon of aseptic gauze. Taking my chisel I enlarged from below the perforation in the bone

made at the beginning. At the second stroke of the chisel over the orbital arch, I laid bare a dull colored area, representing a solution of continuity in the bone. Pursuing my work I came upon a small cavity in the bone filled with granulations, without pus. I resected all the anterior orbital wall, covering the entire orbital arch and measuring about 2 c. m. from and 1 c. m. above the root of the nose.

Curettage of the sinus cavity. The sinus walls, both superior and inferior, were perfectly smooth and formed an acute angle about 1 c. m. in depth. The latter was lost backward and inward in the nasal cavity through the fronto-nasal canal which the curette easily penetrated. The bony wall which separated the sinus from the endocranium was of the thinness of paper. The dura mater was laid bare over a diameter of 2 c. m.

Cleansing with peroxid, immediate suture. A gauze drain was left in the lower third of the frontal incision, communicating with the endocranium, and another in the incision over the orbital arch, communicating with the sinus.

The maxillary sinus was operated upon after Luc's method. It was found studded with fetid granulations.

The results were excellent and without cerebral symptoms.

Reflections.—I have reported this case of anomaly of the frontal sinus, one of rare smallness, enclosed entirely in the orbital arch, in contrast with a case which I have formerly published, where the two sinuses were merged into a single vast cavity comprising the whole frontal area. Nothing caused suspicion of the condition—the examination of the sinus by transillumination showed extensive dimensions.

In closing, Delies insisted upon the necessity of trepaning the anterior wall of the frontal sinus and not of the orbital arch.

Luc asked if in his case it would not have been easier to find the sinus by the orbital route.

Delies answered no, because the sinus was very anterior, almost entirely in the orbital arch.

Moure mentioned a point to differentiate the sinus mucosa from the dura mater. When soft membrane is reached and only a single layer of dense bone has been traversed it is the sinus; if, on the other hand, compact bone, spongy bone, and another layer of compact bone are cut through, the latter is

the internal table of the frontal and the cranial cavity has been entered.

DELIES.—In my case I had to deal with bone which was completely eburnated, and the point mentioned was inapplicable here.

Clinical Remarks Upon Some Cases of Frontal Sinusitis.

MOURE, (Bordeaux).—I desire to make a few observations concerning two patients with frontal sinusitis, upon whom I operated and with results scarcely favorable, especially in one case.

Case I.—A young lady, 18 or 19, with right fronto-maxillary sinusitis. At the first sitting I operated upon the maxillary sinus only; considering the neuropathic condition of the patient I was not sure of the frontal sinusitis.

In spite of the intervention the patient continued to have suppuration and suffer, and her frontal sinus was darkened. I did a second operation, upon the frontal sinus, following the classic technic of Ogston-Luc. I found a small sinus with mucocele.

I had great difficulty in finding the naso-frontal canal, because of deviations. The drainage was ample, however.

Two days afterward the pain reappeared. The dressing was removed and I found phlegmon of the orbit.

An oculist who was consulted, made an incision under chloroform into the orbit and drained it. During the next few days all the symptoms were accentuated, the protrusion of the eye was more marked, the pain greater and the cornea began to ulcerate. One morning we found indications for enucleation, but the following day the patient became better and later recovered. Unfortunately a fistulous tract persisted. I performed another operation in which I completely cleared the sinus cavity and gave free drainage toward the rear because of septal deviation. The results were excellent but not perfect, for the fistulous tract still remained. I propose to do another operation, which will be ethmoidectomy this time.

Case II.—Man of 35; headache since infancy. Double fronto-maxillary sinusitis. Exophthalmus of the left eye. General health poor.

At the first sitting I operated upon both maxillary sinuses. Cure.

At a second sitting I operated upon both frontal sinuses.

On the right I found an enormous partitioned frontal sinus,

containing much pus and granulations. Seeing the large dimensions of this frontal sinus I was almost led to do a complete Kuhnt. I established a large naso-frontal canal. On the left side, after the sinus was opened, a flood of pus poured out, and I found an encysted abscess in the sinus which had pressed back the cranial walls and was forming a recess behind the orbit, having destroyed the arch of the orbit. It might be called a spontaneous Killian operation. Nasal drainage. Suture.

Some days later, the patient showed signs of phlegmon of right upper eye-lid, and while these were progressing until they had almost disappeared, he received a new infection, due somewhat to his own lack of care. No headache, no vomiting, no abnormal pupillary reactions, in short no meningeal symptoms. Some days later, however, the patient had trouble in speaking, and symptoms of cerebral abscess. He fell into a semi-comatose state. I suggested an operation, but it was refused by the family. Death.

In the first of these two instances, the subsequent incidents could be attributed to insufficient drainage, but in the second case, this was surely not the cause which produced exitus. It is true that the patient was feeble, and belonged to the category of patients, whom it is better not to touch.

I will conclude by saying that I am a follower of the operation of Ogston-Luc, which has always given me good results.

The opening in the anterior wall of the frontal sinus should not be too large but large enough to permit thorough curettage of the sinus. As to the nasal drainage its importance is very great and it should be as large as possible.

The following case is in proof: The patient was operated upon for fronto-maxillary sinusitis. After the operation I could not discover any discharge; I saw only some crusts.

Eight or ten days afterwards there was swelling and fluctuation. I incised and found the sinus filled with muco-purulent serum. I re-established communication by removing the crusts which obstructed the canal. Cure.

It may be seen by this that the question of drainage has great importance in operations for frontal sinusitis, but to establish this drainage each operator has his method. Luc passes his finger into the naso-frontal canal. By this procedure it is possible to infect the wound, the nasal fossae being far from aseptic. To avoid this inconvenience I have had constructed a cotton carrier with which I work from above downward,

never from below, upward, in such a way that I do not risk infecting the sinus cavity with the material in the nasal fossae.

LERMOYEZ.—Several operations have the favor of specialists for the radical cure of chronic frontal sinusitis, the Ogston-Luc, the Kuhnt-Luc, the Killian.

The Ogston-Luc, the oldest operation, the most simple to execute, and the most elegant in its results, has the great defect of exposing the patient to recurrences, the gravity of which is sometimes extreme. While some fortunate operators bring forth statistics in favor of this procedure, it is none the less true that other unfortunate operators have been obliged to abandon it. As we know, the chance is more or less good, but not constant—sooner or later there will come to the defenders of this method the inevitable catastrophe which will modify their previous optimism; inevitable because the Ogston-Luc contradicts the general rule of surgery which seeks to avoid dead space.

The Kuhnt-Luc, if well done (and by well done I understand total resection not only of the anterior wall, but also, if necessary, of the inferior or orbital wall of the frontal sinus, as Kuhnt himself has instructed) prevents dead space and almost surely wards off recurrences. And, if there subsequently is a reinfection coming from an insufficiently curetted ethmoid, there will be no question of frontal sinusitis, for there is no sinus. But the Kuhnt-Luc has the fault of producing considerable deformity, especially if the sinus is a large one.

The Killian avoids this by preserving the border of the orbit. It reduces the consequent deformity to a minimum, but while doing this, it leaves a dead space, and consequently the possibility of recurrence slight, it is true, because of the radical clearing out of the ethmoid anteriosly which it permits.

I have recently been able to compare, with regard to recurrence, the value of the two latter procedures. Two patients were operated upon at the same time by me, one by the Kuhnt-Luc, the other by the Killian.

By accident, a gross error in asepsis was made in the preparation of the dressings. About the fifteenth day there appeared in both patients an abscess at the internal part of the cicatrix, coming from a point of ethmoiditis. Now, in the Kuhnt-Luc case the union of the frontal skin to the internal wall of the frontal sinus held good and in two or three days the angulo-orbital suppuration ceased. In the Killian case an

empyema of non-effaced frontal sinus developed and it was necessary to reoperate extensively.

My line of conduct is as follows: Almost never the Ogston-Luc, usually the Kuhnt-Luc, and, if the sinus is so large that the subsequent deformity would be disfiguring, I do the Killian. However, I do not deny that this way of considering the operative indications for frontal sinusitis is imperfect. But it appears difficult to do better at present. Everyone today clings to a procedure which he applies automatically to all cases. It is desirable for us to somewhat forsake therapeusis which absorbs all our thought. Let us turn to pathologic anatomy, take a few hours from the office and devote them to the amphitheatre, and no doubt we will find in the group of frontal sinusites,, which we now tend to consider as of the same sort, various anatomo-clinical types, for each of which is demanded this or that operative procedure. Our specialty will gain by becoming a little more scientific, and our patients will benefit accordingly.

Luc.—There is no more important question of the hour than the origin of intra-cranial complications consecutive to frontal sinusitis.

I cannot give precise statistics at the moment, but in a little over thirty cases, operated upon by me in the Ogston-Luc way before systematically employing Killian's method, I had not less than five or six deaths from intro-cranial complications. The last of these unfortunate cases is particularly instructive, for death followed acute meningitis three or four days after operotion. At autopsy the sinus was absolutely clean, without any trace of pus or any retentions whatever. Defective drainage could not be invoked, the enemy was not in the sinus but else where.

Opposed to these unfortunate results I can congratulate myself upon those obtained by the technic of Killian. The last twelve patients I treated were operated by this method and I had no intra-cranial complication to regret. The superiority of the Killian lies in its thorough, complete and conscientious operation upon the anterior ethmoid cells. The disasters encountered with other methods are due to blind and incomplete curettage of this same area. Now we know how dangerous are incomplete operations upon infected bony cavities; such, for example, is ossiculectomy, harmless when the osteites is limited to the ossicles, but accompanied sometimes by grave complications when there is concomitant antritis. If the Killian operation

succeeds, it is indisputably due to its free resection of the ethmoid.

JACQUES (Nancy).—As Luc said, the interest in the genesis of intra-cranial conditions following operations on the frontal sinus is great. It is unnecessary to believe that the technic of the operation is always the cause of the complication, since frequently there is no retention and the complications appear none the less. I believe that total ablation of the ethmoid is more often demanded than complete suppression of the frontal cavity. Enlargement of the canal is a foolish manœuvre. To do it well, it is necessary, as I have recommended, to make an anterior incision which will allow the ethmoid to be approached from in front. As I think I have shown by a large number of cases, it is possible by the orbital incision to make a complete curettement of the frontal sinus, without touching the anterior wall. In spite of what Lermoyes says, there need be no fear of bad effects from the dead area, since the suppression of the ethmoid makes of the frontal sinus an accessory of the enlarged nasal fossa.

MOLINIE (Marseille).—No operation, not even that of Kuhnt-Luc can prevent a return of the disease, because of the involvement of the ethmoid. It can be said that the operation of Kuhnt-Luc does not always obliterate the frontal sinus, for this result is impossible to obtain in certain cases.

LAURENS (Paris).—I am a follower of the operation of Ogston-Luc, which I have always employed, with good results. Of 35 to 40 cases, hardly one-fourth have had a return of the condition. The procedure is an excellent operation, no matter what the dimensions of the sinus are. In case of a return, I have avoided every complication by making an immediate incision to allow the pus to escape, followed, as soon as possible, by a total sinusectomy. These cases will be the subject of a forthcoming work.

MOURE replied to Lermoyez that the fatal condition which he had related could not be used to condemn the method of Ogston-Luc, since not only had the operation been an extensive one, but the disease itself had made it a sort of spontaneous Killian by the disappearance of the orbital wall.

As to the objection of Jacques, M. replied that his first case was one of a frontal mucocele without an ethmoiditis, and consequently the fistula could not be ascribed to the ethmoiditis.

He did not believe that any operation could cause the total obliteration of the cavity of the sinus, the absence of all dead space. He therefore refused to be a systematic follower of

the method of Kuhnt-Luc. When the patient recovered, it was not due to the absence of that dead space but because they had left a non-infected space.

He concluded, as last year, by saying: In cases of small sinus, the operation of Ogston-Luc; in cases of large sinus or relapse, large resection.

Frontal Sinusitis with Empyema of the Maxillary Sinus in a Woman Aged Seventy-Seven Years. Refusal of Operation. Death.

De Ponthiere (Charleroi) has systematically practiced the method of gouging recomemnded by Mahu in the differential diagnosis of maxillary sinusitis and empyema. He had only praise for it. A recent case proved to him clearly its clinical value. A very nervous patient, in whom he had made two lavages and in whom Mahu's sign indicated a simple empyema, refused to continue the lavage, and demanded the radical operation. P. did so, and after opening the sinus, showed the existence at the most of a small quantity of muco-pus. He merely cleansed the cavity and closed it. Cure.

Lermoyez.—It is not without hesitation and deep reflection that I have concluded to speak of something which has engaged my attention for a long time.

In its somewhat paradoxical appearance my idea might seem to be a return to ancient errors, which, however, is far from my thought.

We are in the habit of considering chronic frontal sinusitis as an affection seriously menacing existence, and of systematically advising our patients to be cured by operation. We are led to such a conclusion, firstly, by a consideration of the anatomic relations of the sinus; secondly by comparison with that which occurs in the suppurating ear, and lastly by the observation of cases such as those reported by Mahu.

However, are things just as we figure them? Is frontal sinusitis as grave as it is believed, and how far are we authorized in advising operation? As to the first point: Each of us has seen numerous patients, succumb to cerebral complications of otitic origin. There are, on the contrary, few cases of fronto-cerebral complication. In proof is the fact that Mahu would not have made his report if it had been a common case of cerebral fatality of otic origin.

In the second place, if we scan the observations published in the different special journals, we find few cases of fatal cerebral complication in the course of chronic frontal sinusitis. And it is curious that the number of cerebral deaths

appears as great, if not greater, in the operated sinuses, than in the non-operated. Now, these approximate statistics should be true, for we all tend more to publish the history of patients who die after refusing operation, than the history of those who underwent operation and died.

In the third place we cannot exactly compare the middle ear to the frontal sinus; the middle ear is a very rebellious cavity, whose drainage is anatomically very imperfect, while the frontal sinus is, on the contrary, a simple cavity with rapid evacuation.

In the fourth place I insist upon this point. When we trephine a suppurating ear we always meet with greater lesions than we expected; in chronic frontal sinusitis, even in the course of an exacerbation, it is always a surprise for us to find other than a slight change in this region, with relation to the intensity of the symptoms. The trephined ear shows extensive bone lesions, parietal perforation, the lateral sinus, the dura mater exposed and granulated. The frontal sinus on being opened usually shows healthy bony walls, pus restrained, mucosa only slightly fungated, and that is all.

Far from my thought is it to consider frontal sinusitis as an insignificant affair and to deny the usefulness of operation. But I believe that in the clinic we ought to be opportunists and not radicals; that to tell every patient with frontal sinusitis (as in ear suppuration) that he has a mortal malady and that he must be operated upon, is extreme. Wait until reports prove the falsity of this prognosis and prove that surgical intervention is not as harmless as we are pleased to say.

In few words: To have chronic frontal sinusitis is less grave than we believe; to operate for frontal sinusitis is more grave than it is said to be.

I speak to draw attention to this point, and I now leave the matter to statistics.

Two Interesting Cases of Endocranial Complication From Suppurative Otitis Media.

BONHIN (Brest).—These two observations are interesting from two different points of view. In the first there was a sub-arachnoid meningeal hemorrhage following shortly after an electro-diagnosis of facial paralysis in a patient operated upon two months previously for chronic otorrhea and mastoiditis. Death ensuing within 48 hours it was naturally attributed by the patient's family to the employment of the electricity. The vascular changes are of course the only harmful ones in this case. But we may ask whether in the

absence of the usual causes of fascular change, the otogenous infection of long duration may not be blamed

The interest of the second case lies in the rarity of the lesions observed, the exact diagnosis of which was difficult if not impossible. There was adhesive thrombosis of the right sinus, with an empty lateral sinus corresponding to the right ear which was attacked with otorrhea and condensing mastoiditis. Lastly, there was suppurative leptomeningitis of the opposite cerebral hemisphere.

Two Cases From the Laryngological Clinic.

JACQUES (Nancy).—(1) A hook caught in the larynx; extraction by inter-crico-thyroidal laryngotomy—The patient was a girl of 5½ years; the body, a corset hook of 12-18 millimeters, lay between the cords, the hook disappearing in the subglottal space and the rings lying on the upper surfaces of the vocal bands. The narrowness of the approach and the position of the body necessitated an operation from without, i. e., a single incision in the crico-thyroid membrane. This simple method ed an incision in the thyroid. It furnishes, even in a child, an entrance into the subglottal space large enough to permit the extraction of a foreign body whose transverse dimension does not exceed the antero-posterior diameter of the larynx.

(2) Bilateral crico-thyroidal ankylosis following a high tracheotomy (intercrico-thyroidal laryngotomy).

The patient was a man of a man who had been operated on in America, in an emergency, for a stenosis due to gummi of the right vocal cord, and who had worn a canula for 14 years. The incision in the air passage was made in the circo-thyroidal space encroaching somewhat on the thyroid itself. The presence of the canula in the subglottis seemed to have caused a partial, bilateral symmetrical ankylosis of the cords in the cadaveric position. This observation confirms the opinion expressed by Moure of the dangers of the high incisions (laryngotomy and crico-tracheotomy) in the treatment of acute stenosis of the larynx. An actual stenosis can develop secondarily by fibrous ankylosis or chronic myositis.

RUAULT did not think that the high tracheotomy was a bad operation. If it gave bad results it was because a canula too large or too long was used. He himself, always tried to make the inter-crico-thyroidal operation, and inserted a small canula which was sufficient for respiration, did not disturb the patient, and caused no trouble in swallowing.

The Treatment of Laryngeal Tuberculosis.

MERMOD (Lausanne)—The active interventions classed by Heryng as surgical treatment are far from being in favor today, and if Heryng claimed 5 years ago that he knew colleagues who did not dare to publish fortunate cases for fear of being compromised, it is just as true now. The objections are many; the nature of the process, almost always secondary; fear of spreading the process either in the organism or the larynx itself by opening new paths of infection; relapses which are the rule; difficulty in treatment finally, possibly of curing by general treatment.

The author is not the only one to admit that primary laryngitis is much more frequent than has heretofore been supposed, but is far from limiting intervention to the minority of cases, having been able to convince himself a number of times, that the larynx can heal in spite of much involved lungs and that this cure has an enormously favorable influence on the lungs themselves.

The dangers of post-operative dissemination, of which the author reports two doubtful cases of his own, are rare and more theoretic than real. Even though recurrence takes place, which is not the rule, the patient is markedly benefited, often for years; it is not more grave than the primary attack and not more difficult to treat, if the patient is not lost to sight too long. As to the pretended difficult technic it cannot exist except for the debutant. Finally, the cases of spontaneous cure are too rare to be used as arguments for non-intervention.

The rational treatment should be as surgical as possible, even in the primary period, when the disease is circumscribed and the general condition best. And later, except in absolutely hopeless cases, it is better to operate upon a larynx that is seriously involved, cure ensuing sometimes and improvement always. There is not only relief of short duration, as in certain medicinal treatment, but real improvement, depriving laryngeal tuberculosis of its cruel character.

The speaker sought to show that the method of timid treatment lost valuable time. The treatment with lactic acid does not merit its renown; it is slow and painful, and ineffications as soon as the tissue is infiltrated. Interstitial injections are still more painful and constantly invite edema—the speaker reported 3 cases where tracheotomy became necessary.

Curettage, a brutal method, has the inconvenience of lifting masses of tissue without completely detaching them. Ablation with the cutting forceps is more surgical; it would be the best

of all procedings and with a proper technic would permit complete cleaning out of the larynx per vias naturales if the danger of hemorrhage were not present. This is why the galvano-cautery method remains ideal, obviating hemorrhage and infection better than cutting operations. Edema occurs only in the books. The method will not succeed unless it is used energetically with the destruction of large masses of tissue. The good old thermic is still the best we have to hasten sclerosis; nothing has been able to dethrone it and it deserves first rank in the treatment of laryngeal tuberculosis. The speaker, in support of his conclusions, reported fifty cases all favorable to surgical treatment. In many of these cases there was definite cure, even when the state of the larynx appeared desperate, and the number of successes augmented with the exclusive employment of the galvano-cautery.

External Peritonsillar Phlegmon. Infection Due to Foreign Body.

AIMAR RAOULT (Nancy).—E. D., aged 24 years, came to me for consultation July 21, 1903. His condition as noted by my confrere, Dr. Pillement, was as follows:

The patient had had violent pain for eight days in the ear and was unable to open the mouth. Deglutition was impossible both for solids and liquids. During this time the patient had insomnia, absolute anorexia, and fever. His color was leaden, the skin was covered with profuse perspiration, in short, he presented all the indications of septicemia.

The head was inclined towards the left side, and a considerable puffiness of the left retro-and submaxillary region could be seen. This puffiness gave on palpation, a sense of woody hardness, and it was only with difficulty possible to make out the underlying ganglia, which were embedded in a mass of connective tissue infiltrated with cells.

The patient was hardly able to open his mouth half way and the teeth and tongue were covered with athick saburral coat, and the breath was very fetid. It was very difficult to depress the tongue and examine the throat. The soft palate on the left side was edematous in front and behind the tonsils. This was adherent to the anterior pillar, which almost completely covered.

Finally, the entire left tonsillar region was swollen, extending internally and anteriorly.

Pillement punctured the soft palate just behind the tonsil, by means of the electro-cautery, which procedure yielded a small quantity of pus. He at the same time prescribed powder-

ing with warm menthol-phenique, and hot compresses to the neck.

On the morning of July 22, the patient knowing that I should have returned, came to my office. The pain had become worse and worse, the general health was very bad, so I suggested that he enter my hospital. He refused and went home, a village near Nancy. The same evening, as I could not leave, Pillement went to see him and made a new incision with a bistory, behind the tonsil. This incision again gave a little pus. After this operation, the patient felt relieved; nevertheless, in the night, the pains reappeared, and the patient decided to go to the hospital the next day.

July 23, I saw him at Ste. Marie's hospital. The pain which had diminished some after each operation, had increased. The general state was worse and worse. On introducing my finger into the mouth, and pressing on the left tonsil, while the other hand was placed on the lateral region of the neck immobilizing the skin, I could feel a deep fluctuation. There was at the same time a subtonsillar and peritonsillar abscess.

To open the external peritonsillar abscess through the mouth was difficult because the patient could not open his mouth, and even more because of the adhesion of the tonsil to the anterior pillar of the palate, which entirely covered it. In order to make this opening, I used a pair of curved scissors held in the left hand, guiding it by my right finger introduced into the mouth. With the scissors, I attacked the internal face of the tonsil, making an incision about one centimeter deep, then closed them and utilized them as a probe to open up the deeper parts, and to get at the abscess. When this occurred, a mass of extremely fetid pus appeared.

During the following days, the cure gradually progressed. The adenopathy diminished and the general condition mended very rapidly. At the end of a week the pharynx and tonsils had taken on an almost normal appearance.

The day after the opening of the abscess, the patient said he felt on expectorating some pus, a sharp body which pricked him in the mouth. He showed us the foreign body. It was a kind of little straw, 1½ centimeters in length, very slender and undulated.

He then remembered the following facts, with which he had not made us acquainted in the beginning: About the end of June, while out walking, he chewed an ear of wild barley. He swallowed a piece of it which stuck in the lower part of the left tonsil. He said that at that moment, he had felt a sharp sensation of pain. With his fingers, he pulled

out a piece of the spicule, and thought he had removed all. Some days later, when he had forgotten about this, he felt a slight pain in the tonsillar region, which increased during the succeeding days. Little by little, he experienced difficulty in opening his mouth. In about a week the pain became very great on deglutition. Finally, about the 15th day, the adenopathy appeared.

This case seems worthy of relation on account of the two following peculiarities:

1. Coincidence of the subtonsillar with a peritonsillar abscess.

2. Infection of the tonsil by a foreign body, and the very gradual evolution of the phlegmon before the apparition of grave symptoms.

Results of the Application of Penghawar in Hemorrhages of the Skin and Mucosa.

MOUNIER.—Penghawer, already introduced into France, has been employed by the author for more than a year in all his intranasal operations. He advises careful cleansing of the wound before applying the fibrils of djambi, which may slip between the mucous layers and produce irritation of the tissues. The penghawar is put in without stuffing the nose, and is removed by forceps after 24 hours.

Its advantages are as follows:

1. Perfect hemostasis, even after the use of adrenalin.

2. Permeability of nasal fossae, which is not obtained with ordinary dressings.

3. No hemorrhage upon removing the fibrils, such as occurs with other dressings.

4. More rapid cicatrization of the wound.

External Oculo-motor Paralysis, Otitic Origin.

LANNOIS AND FERRAN, (Lyon).—H., 38 years old, after ten days of violent pain in the left ear, had a discharge which at first gave relief. Then the pain reappeared in the ear, together with diplopia. The latter was due to external oculo-motor paralysis of the same side. Insufficiency of drainage: incision of a large swelling above and behind. Cure of the otitis and abductor paralysis in three weeks. At no time were there symptoms suggesting involvement of the apophysis, the meninges, etc.

The writers, after discussing various theories (subdural abscess, edema of the pia mater, meningitis, cerebellar abscess, etc.), conclude that in slight cases such as theirs, paraly-

sis of a reflex nature may be produced probably through the vestibular nerve and Deiter's nucleus whose relation to the nuclei of the oculo-motor nerves is known.

This case shows that it is not always necessary to attach grave prognostic significance to ocular palsies arising in the course of otitis.

LUBET-BARBON. I have seen two cases of external oculo-motor paralysis, upon the diseased side, in cases of otitis. Both patients were trephined. In the first, a girl of seven, the trepanation was carried into the skull, through fear of an extradural abscess going to the lateral sinus. It is a curious fact that under the chloroform the paralysis seemed to disappear and both eyes were turned upward and toward the diseased side so well, that I wondered if the paralysis was not due to contracture of the common oculo-motor.

Both patients were cured which proves that these troubles are not as grave as they might be if due to an intracranial lesion.

M. CHEVAL (of Brussels.)—I thank M. Lannois for his interesting communication. It permits me to say a few words concerning a curious case of paralysis of the external oculo-motorius, the sole sign of an apparently cured otitis. Upon entrance at the Hospital of St. Peter, Brussels, the patient told us that he had been treated six weeks previously for an acute influenzal otitis, the right ear having suppurated, and complained of intolerable occipital pain. The tympanum was cicatrized; the temperature during his sojourn varied from 37 to 38.5 C.; the patient presented a paralysis of the right external oculo-motor nerve. Analysis of the cephalo-rachidian fluid gave no information.

I proposed an antrotomy, prior to cranial trepannation for examination of the cavernous sinus. The patient refused. An amelioration of the symptoms set in; the temperature was about normal, the occipital pains disappeared. At the third examination the patient complained of embarrassed deglutition and a painful sensation in the cavum. We found a swelling in the fossa of Rosenmueller, which projected beyond the posterior pillar. Its incision gave issue to a little pus. The temperature which had reached 39.5 came down to normal the external oculo-motor paralysis ceased.

I do not believe the patient is cured; I persist in thinking that I ought to operate. The abscess shows the possibility of a lesion of the tip of the petrous, but I shall wait for new indications. The patient remains thin, under observation.

Note upon the Employment of Adrenalin in Malignant Affections of the Throat.

RAOULT, (Nancy).—The author had several times employed adrenalin (1 per cent.) on tampons to malignant tumors of the pharynx and larynx. In this case the adrenalin had been applied in small quantities for several months. Finally sloughing of the diseased tonsil took place, accompanied by violent reactionary phenomena.

Action of the N-Rays Upon Audition.

RAOULT, (Nancy).—The N-rays discovered by Blondlot have been studied by Charpentier as to their physiologic action. The experiments described by Raoult were made in collaboration with Prof. Charpentier. Bodies emitting the N-rays clearly produce an augmentation of auditory phenomena, whether brought near the ear or applied to the cranium in the vicinity of the auditory centre, or the subject touch with the finger tip the source of the N-rays. Moreover, it appears that the increase of hearing is accompanied by an elevation of tonality, for example if diapason be used. Finally, the N^2-rays diminish audition.

A Case of Neoplasm of the Larynx Treated with Success by the Roentgen Rays.

BECLERE AND PAUL VIOLLET.—The patient had cancer of the larynx and was subjected to radiotherapy by Dr. Beclere. The diagnosis of cancer was made by Drs. Viollet, Chauffard, Launay and A. Beclere.

However, the microscopic examination being wanting, the value of this case as a demonstrating of the efficacy of radiotherapy for cancer might be debatable. It is none the less interesting as showing that the X-rays can exercise a favorable action upon lesions of the laryngeal mucosa through the cartilaginous framework of the larynx and the soft parts covering it.

If the diagnosis of cancer was justified it remains for time to confirm the results obtained, the cure being too recent to permit final judgment.

The patient, M. B., shown to the society, on Nov. 25, 1903, had a tumor of the left lateral wall of the larynx. It did not seem ulcerated, but as it projected considerably into the laryngeal cavity, it concealed a large part of the vocal cords, and extending beyond the aryteno-epiglottic fold of the diseased side, it reached the neighboring wall of the pharynx. The patient, furthermore, showed an adenitis on the left side of the larynx, of the size of a small nut.

The dysphagia was very pronounced. The patient had lost 18 pounds in two months, being unable to feed himself, without extreme pain, with anything except a little milk. His voice was considerably changed.

As the patient had refused a total laryngectomy proposed by Launay and Viollet, Dr. Chauffard conceived the idea of sending him to Dr. Beclere to try the effects of radio-therapy.

Dr. Viollet, who followed the evolution of the lesion, found on Dec. 25, an ulceration of the tumor, which seemed on the point of necrosis. Two months later, the tumor had decreased in size, and the ulceration was limited to the region first occupied by it. The adenitis had almost completely disappeared. There remained at the place of the tumor, only a sort of cicatrical excavation in the center of which the left arytenoid could be seen. Only the immobility of the left side of the larynx had persisted. The cervical adenitis had disappeared. The patient had gained 16 pounds, he ate without difficulty, his voice was completely restored. The patient had been treated by Beclere with the X-rays from Dec. 1 to Dec. 12, 1903, on Dec. 23, 24, 25 and 26, 1903, on Jan. 11 to Jan. 31, 1904, and from March 7 to 29, 1904. Instruments—induction coil of 35 cent. spark, primary currents 6 amperes, 70 volts, a Villard osmoregulator, a spark of 7 centimeters.

The distance from the tube to the skin was 15 cent. During the first period of the treatment the left and right sides of the neck were alternately exposed, but during the remainder only the affected side. The length of the treatment was 15 minutes, during the first 3 periods of treatment, and 10 minutes during the last. Discontinuance of the cure was necessitated by a radio-dermatitis having cause a redness and even vesication in one case.

So far only one comparable case has been published, viz., that of a lawyer with a laryngeal tumor diagnosed as cancer and treated with the same success by W. Schreppergell (*Revue. hebd. de laryngologie*, 1903, No. 11, page 305).

DELSAUX.—I have had no personal experience with the Roentgen ray in cancer, but I have had occasion to submit a case of epithelioma of the larynx, whose diagnosis had been confirmed by the microscope to the action of radium. The results, though incomplete were satisfactory. As a result of the treatment the superficial tissue of the tumor became condensed.

I hope to obtain better results with a purer radium than I used.

In addition, I cured a case of squamous epithelioma of the nose in six treatments.

The Post-Operative Treatment of Petro-mastoidectomy by Insufflation of Boric Acid and the Immediate Resection of the Posterior and Superior Walls of the Membranous Meatus.

CABOCHE, (Paris).—Delsau confirmed the excellent results obtained by him in 20-25 cases. But he asked why the author did not more often employ suture of the flap.

Lermoyez asked what was the proceding of the author in cases of large mastoid openings with large denudation of the sinus and destruction of the mastoid tip and even a part of the temporal squamous.

LOMBARD was not partial to immediate suture. It was sufficient to allow the retroauricular wound to close little by little. As to the large wounds mentioned by Lermoyez, the speaker had been able to treat them by boric acid dressings only.

CABOCHE. We did not suture immediately, especially for the purpose of watching the progress of epidermization in the proceding employed.

We believe that there are no inconveniences in making immediate suture except in case of infected cholesteatoma, or in case of very free opening of the mastoid cavity.

As to the large wounds mentioned by Lermoyez there is no contraindication to filling the auricular cavity with powdered boric acid, and dressing the remainder of the wound according to the principles of general surgery.

DR. HENNEBERT. In one case, had had perfect success with boric insufflation, and resection of the posterior wall of the membranous canal.

Voluminous Polypi of the Choanae. Extraction by the Buccal Route. General Remarks.

BAR, (Nice).—In this communication the author applied himself to a minute description of the symptoms of nasal polypi and set forth the various procedures for the cure of this affection. Extraction by the buccal route alone succeeded in this case. It is sometimes the sole possible means to employ either by reason of the enormous size of the growths which cannot be extracted by the nasal way, or because it is the only way of grasping them. The observation also showed the possibility of mixed polypi, such as Paris previously confirmed in an anatomopathologic study of this species.

Hemmorrhagic Inflammation of the External Auditory Canal and Middle Ear.

BAR, (Nice).—The author, in support of what he had previously said in a former work upon hemorrhagic otitis externa, reported a case in which inflammatory phlyctenules distended

with dark blood having been observed in the external ear, the inflammation did not limit itself to the meatus but rapidly invaded the tympanum, in such a way that a bloody discharge came through the tube into the pharynx, and through the meatus both from the canal and the tympanum after perforation of the membrana. The literature shows few cases. They should generally be regarded as grave and of infectious origin, influenza among other causes. Colonies of microbes are found among which the staphylococcus pyogenes aureus has been remarked.

The Most Practical Procedure for Removal of Incarcerated Tonsils.

LOUIS FACHER, (Orleans).—A firm partisan of total ablation of diseased tonsils, whatever be their size, I have continually sought for a method which would be the simplest, the most rapid and the least dangerous.

The employment of my forceps for curetting the tonsillar recess, which has become common, has made marked progress in this matter. But by modifying the cautery snare or cold snare methods it is possible to remove the tonsil entirely at a single stroke.

My method is as follows:

1. Liberate the tonsil as much as possible from the pillars in front, behind and below with the stylet of Higgnet, the plicotome of Lermoyez or my stylet scissors.

2. Pass through the loop my mouse tooth forceps, or Museux's, seize the tonsil far back, draw it inward and carry the loop toward the pillars while the tonsil is drawn from its seat.

3. Contract the loop and turn on the current. If the cold snare is used contract it slowly in order to crush the vessels before cutting them. The cutting should be slow in proportion to the age. Thus the danger of hemorrhage is diminished, which for that matter is very rare and less to be feared than with any sort of morcellation. Traction upon the tonsil, drawing it from its seat, does not lead to cutting large vessels, since it has been shown that between the tonsillar bed and the internal carotid there is the pharyngeal wall and the pharyngomaxillary space. I have removed the tonsils by this method many times. I have found only advantages and no inconveniences in this method.

Consultation in a Case of Laryngectomy.

MOLINIE, (of Marseilles).—He related an observation of total laryngectomy done upon a man of 63 for carcinoma of the larynx. The patient was well, surgically, on the 8th day,

being able to swallow normally, but succumbed 6 days later of broncho-pneumonia which came on 5 days after operation. Molinie brought out the contrast between the operative cure and the fatal outcome of the broncho-pneumonia. He believed that the latter might follow by operative and post-operative infection. He recommended as preventive measure to operate aseptically by avoiding any flow of blood into the trachea, and to follow operative by post-operative asepsis, that is to say by local and personal asepsis. M. presented the material removed at operation.

Syndrome of Meniere Recurring in the Course of Chronic Catarrhal Otitis. Cure of the Vertigo by Retro-nasal Curettage.

BERTREMES, (Charleville).—Patient aged 59 ears. Vertigo, tinnitus, vomiting for 18 years. Slow progressive left deafness. Retraction of left tympanum, hypertropic retronasal pharyngitis, intact labyrinth. Air inflation improves audition, and continued for some weeks, diminished the number of vertiginous attacks. Post-nasal curettage and discission with Ruault's hook. No vertigo since; cure maintained up to the present.

Gummata of the Intermaxillary Region.

VEILLARD, (Paris).—Two cases of gumma of the nose. The lesions were localized by the anterior part. The first patient presented the cardinal symptoms of nasal obstruction and pain upon pressure, permitting an early diagnosis. Specific treatment led to a rapid disappearance, but there were several returns, and at the end of two years, if the patient ceased treatment long, the nose became stopped up, the palate became sensitive and the four upper incisors were loosened.

In the second patient the lesions were still more serious. There was successive elimination of two cuneiform sequestra, each containing two incisors, corresponding exactly to the two intermaxillary bones. Cicatrization, Prosthetic apparatus.

Ethmoido-Sphenoidal Empyema in a Child of 12. Clearing the Ethmoid Labyrinth and Curettage of the Sphenoidal Sinus by the Orbital Route.

ESCAT, (of Toulouse).—A boy of 12, after a probable streptococcic angina, was attacked with acute otitis and ethmoido-sphenoidal empyema complicated with orbital involvement and optic neuritis, followed by atrophy. Two months after the beginning of the illness I was called to operate. After unsuc-

cessful endo-nasal treatment I went in throuph the orbit, opening the ethmoid labyrinth in the course of which the middle and superior turbinates were removed, and I utilized with great facility this route for curettage of the sphenoidal sinus. Considering the nasal drainaye sufficient, I sutured the orbital wound. Favoraple results; complete cessation of nasal discharge and cicatrization after 7 weeks.

From this operative result I conclude:

1. That in case of ethmoido-sphenoidal empyema, the orbital route alone suffices to reach the ethmoidal labyrinth and sphenoidal sinus.

2. That the substition for the ethmoid labyrinth of a large bony cavity, giving free communication between the orbit and nasal cavity fully assures nasal drainage without orbital drainage.

Laryngeal Tuberculosis. Inter-crico-thyroid Laryngotomy. Final Thyrotomy with Resection of the Right Vocal Cord; Survival for Eighteen Months.

CHAVASSE, (of Paris).—The patient came for treatment the first time in a state of asphyxia which necessitated urgent laryngotomy. He had perichondritis and diffuse infiltration of the larynx. The expectoration contained Koch's bacilli. Syphilis 19 years previously. Specific treatment after putting in a permanent canula, stopped the perichondritis, but the intralaryngeal infiltration persisted together with tuberculosis vegetations.

Thyrotomy with curettage of the laryngeal cavity and excision of the right vocal cord was then done. Three months afterward the patient was able to take up his duties; he still had, however, a thyroid fistula, opening intermittently. He died of terrific hemoptysis 18 months after operation, when he considered himself cured and was in full activity.

Treatment by Mastoid Opening of Condensing Osteitis (Neuralgic Form) of the Mastoid Apophysis, Which Complicates Chronic Otitis Media.

AUGIEROS, (of Laval).—This work was based upon the observation of four cases. The characters of the affection are:

1. A violent and persistent neuralgia of the affected side, assuming the fronto-temporo-occipital or temporo-occipital type.

2. Absence of external signs of mastoiditis except spontaneous pain and pain provoked by pressure.

3. Lack of proportion between the intensity of the pain

neuralgic crisis demanding operation, the otorrhea had been cured and tympanum epidermized 6 months. In the second case there was only slight suppuration. In the third case there had been no discharge from the ear for two years. The last case had old chronic middle ear sclerosis, the ears never had suppurated, there were no cicatrices of the m. t.

4. Resistance of the neuralgia to all treatment and hyperesthesia of the ear which manifests itself in an exacerbation of the pain after the instillation of analgesic solutions, however weak and unirritating.

5. The great effect of the malady upon the general state of the patient (insomnia, anorexia, rapid and extreme loss of strength).

6. The rapidity of the cure of the neuralgic pain, which disappears quickly after mastoidotomy.

The bone alterations found at operation are those of condensing ostetis at different stages, without trace of suppuration.

The neuralgic pains are explained as due to compression of the nerve filaments in the condensed bone tissue.

Conclusion—Condensing osteitis of the mastoid is a formal indication by itself for mastoid opening, independent of the state of the ear. The operation should cover the greatest possible extent of external mastoid wall and should remove most of the condensed bone.

From the standpoint of the relation of otology to general medicine, condensing ostestis of the mastoid may be compared with an affection observed by Prof. Gosselin in the long bones which he has described under the term of neuralgic or osteoneuralgic osteitis in his clinical lectures and in the article upon bones in the new dictionary of medicine and practical surgery. Professor Gosselin has not observed this affection in the flat bones.

(To be continued in next issue.)